

3.4 TERRESTRIAL AND WETLAND BIOLOGICAL RESOURCES

This section identifies the existing terrestrial and wetland biological resources potentially impacted by the Dutch Slough Restoration Project. Also included are some impacts of the related Ironhouse and City Park projects (Related Projects) that may affect or contribute to the cumulative effects of the Dutch Slough Project. Information in this section is based on a literature review, site reconnaissance including plant and bird surveys, a number of technical reports prepared by DWR and others for the project parcels, and reports on proposed developments on adjacent parcels. These reports are listed in the references section.

3.4.1. Affected Environment

Landscape Setting and Habitat Trends

LOCAL AND REGIONAL HABITAT TRENDS

The biological resources within the Dutch Slough area are affected by, and are part of, populations, communities, and habitat types that occur within the Antioch and Oakley area and adjacent portions of the Sacramento-San Joaquin Delta. These terrestrial and wetland features are undergoing substantial changes that cumulatively affect the status of biological resources within the project area.

Adjacent agricultural lands similar to those of the project area (originating as diked, reclaimed marshland, converted to lowland pasture and hay crops; managed grassland) are undergoing rapid conversion to residential and urban development. A large block of reclaimed marsh between Marsh Creek, Dutch Slough, and Sand Mound Slough to the east until recently supported a suite of habitat types typical of these lowland managed grasslands – ditches with freshwater marsh, extensive pastures and hayfields, ruderal (weedy) habitats, seasonal wetlands, patches of riparian woodland – in an extensive, unbroken, relatively homogeneous landscape unit including the three Dutch Slough Restoration Project site parcels, as well as the Related Project parcels. This landscape pattern provided continuity for dispersal of plant and wildlife populations across them. The stability and resilience (viability) of plant and animal populations, particularly rare species and those with limited dispersal ability, are likely to be affected by this landscape-level change.

Currently, the Dutch Slough Restoration Project and Related Project sites are mostly isolated by residential subdivisions to the south and east that were until recently managed lowland grassland (Dal Porto North, Biggs parcel, Leshner parcel; “East Cypress Corridor” area). Consequently, many of the Dutch Slough resident terrestrial species’ populations are no longer exchanging individuals with a larger, continuous populations distributed across larger habitat patches. This landscape-level change in continuity of habitats and populations is significant in particular for species with limited dispersal ability, species that require extensive blocks of habitat, and species that depend on large-scale population turnover (local extinction and colonization over wide areas). The Dutch Slough area wetlands and terrestrial habitats are now relatively more isolated and island-like in some respects, compared with recent past conditions.

HABITAT FRAGMENTATION AND HABITAT ISLANDS

Populations of wetlands species of the Dutch Slough Restoration Project parcels are still connected to locally extensive wetlands of Marsh Creek and Big Break through the Emerson Parcel and sloughs. The blocks of reclaimed historic marshlands south of Dutch Slough between Big Break and Sand Mound Slough (Dutch Slough wetland/terrestrial habitat complex) are separated by minor internal barriers to dispersal of wetland and terrestrial species (narrow irrigation ditches, small sloughs with terrestrial connections at their southern ends). In contrast, reclaimed wetlands north of Dutch Slough are separated from this connected complex by wide sloughs and open water. Exchange of terrestrial and wetlands species may occur across these wider, often turbulent open water “barriers”, but long-distance dispersal across them would probably be relatively infrequent compared with contiguous parcels within the Dutch Slough habitat complex. Big Break and Marsh Creek are likely to exchange individuals (including potential colonizers, or “founder populations” of restored habitats) at the Dutch Slough and Ironhouse parcels. The Contra Costa Canal, which borders the site at the south, is also likely to act as a local population source and dispersal corridor for wetland and terrestrial species (Swaim 2005). Many highly mobile and widely dispersed wetland species are likely to reach the Dutch Slough and Ironhouse parcels through tidal exchange in Delta waters, connecting large delta wetland areas nearest Dutch Slough, such as Lower Sherman Island, by long-distance dispersal across open tidal water.

The Antioch Dunes National Wildlife Refuge, located along the south shore of the San Joaquin River two miles east of Marsh Creek (western edge of the project site), is only remotely related to terrestrial habitats of the project site, but it is significant because it is literally a disjunct, isolated refuge for rare species that require distinctive interior dune (disturbed sand) habitats (see description below). The project site also includes small remnant “sand mound” topographic-soil units that are derived from the same ancient river floodplain dune sheet that included the sand quarry that became Antioch Dunes. The Refuge is actively managed to maintain viable populations of its rare and endangered species.

Project Site and Adjacent Habitats

VEGETATION AND PLANT SPECIES

VEGETATION OVERVIEW. The vegetation at the Dutch Slough Restoration Project and Related Project sites can be broadly classified into several types of terrestrial and wetland vegetation that characterize major habitats. Many of the broad vegetation and habitat types are relatively well-defined terrestrial (upland) and wetland features, but the prevalent vegetation type, pasture, is a complex of transitional terrestrial and wetland habitats (which may or may not coincide with legal “wetland” determinations). While some vegetation patches can be relatively stable, the boundaries of vegetation types in areas transitional between wetland and terrestrial vegetation, represented in vegetation maps, can be naturally imprecise, and often vary among years. These boundaries in intermediate wetland/terrestrial vegetation are modified by variations in climate, hydrology, disturbance history, and ecological processes such as population spread or competition. The interpretation of transitional vegetation types may also differ among observers and scientific (or regulatory) classification criteria used. A useful “snapshot” representation of the 2004 boundaries of broadly distinct vegetation-habitat types (cover types) of the project site is presented in Figure 2-5 (DWR 2004a). A version of this map is modified to show the approximate distribution of relatively arid, ungrazed “pasture” or hayfields of the Emerson Parcel (see Figure 2-10).

The tidal wetland vegetation bordering Marsh Creek, Dutch Slough, Emerson Slough, and Little Dutch Slough includes freshwater marsh, submerged aquatic vegetation beds (mostly non-native invasive species), floating aquatic vegetation mats (mostly non-native species), and riparian woodland. The upper boundaries of freshwater tidal marsh vegetation are relatively stable, established by periodic tides. A large patch of mature freshwater tidal marsh occurs at Big Break at former positions of Marsh Creek delta, next to the west side of Emerson Parcel. Other tidal wetland vegetation around the project site occurs as narrow fringes along levees, or old side-cast spoils from former channel dredging.

The types of non-tidal wetlands within the diked historic Delta marshlands include variable assemblages of perennial freshwater marsh vegetation, “alkali-meadow” (a type of seasonal wetland with brackish to alkaline soil, intermediate between grassland and marsh), and seasonal to perennial ponds. Large patches of perennial emergent freshwater marsh (soil moist, saturated or flooded in late summer/fall, flooded winter/spring and part of summer) occur in undrained deep depressions (strongly subsided areas) at the north ends of the Gilbert and Burroughs Parcels, and a cluster of freshwater marsh patches occur also at the north-central part of the Emerson Parcel. Alkali meadows occur in shallower depressions, generally nearby the perennial freshwater marshes.

TRANSITIONAL TERRESTRIAL AND WETLAND VEGETATION: IRRIGATED PASTURE. The prevalent existing vegetation and habitat type at the Dutch Slough Restoration Project and Related Project sites is irrigated cattle pasture, an altered form of grassland vegetation. Both terrestrial and wetland vegetation types occur on natural as well as constructed gradients on the site, and areas transitional between wetland and terrestrial vegetation may not maintain clearly distinct boundaries over time or geographic areas. The distinction between wetland and terrestrial vegetation is also made somewhat ambiguous because of the general mapping convention of the most abundant general habitat/vegetation type, “seasonal farmed wetlands” (estimated on the Dutch Slough Restoration Project site at 748 acres by DWR), which may occur in wetland and terrestrial phases.

The pastures of the site are mostly managed by flood irrigation (ditch flooding and drainage, control of indirect groundwater elevation relative to the ground surface pumping; see Section 3.1, Hydrology and Geomorphology), and are intensively grazed or hay-farmed. Areas mapped as “seasonal farmed wetlands” contain mostly non-native grasses, as well as seasonal wetland vegetation types on clayey or peaty soils (saturated or flooded for prolonged periods in winter or spring, and potentially during summer irrigation in some areas. Because technical, legal criteria for federal jurisdictional wetlands (specific to fill permits under the Clean Water Act) are expressly not habitat or vegetation classifications, “wetlands” described in this discussion of biological resources should be understood to be vegetation or biological habitat types based on ecological, rather than legal, characteristics. The U.S. Fish and Wildlife Service’s Cowardin classification system of wetlands corresponds with this usage.

On the project site, grazed “pasture” areas with transitional wetlands or intermittently wet meadows include freshwater seasonal and perennial marsh plants, as well as grasses tolerant of wet soils, including rabbit’s-foot grass (*Polypogon monspeliensis*), Bermuda grass (*Cynodon dactylon*), native and non-native barley species (*Hordeum* spp.) nutsedge (*Cyperus eragrostis*), wire rush (*Juncus balticus*, syn. *J. arcticus*), toad rush (*Juncus bufonius*), watergrass (*Echinochloa crus-galli*), non-native dock species (*Rumex* spp.), and spikerush (*Eleocharis macrostachya*). Introduced non-native forage grasses and forbs are also widespread in irrigated pastures, including canary grass (*Phalaris arundinacea*), meadow fescue (*Festuca arundinacea*), non-native plantains (*Plantago* spp.) non-native clovers (*Trifolium* spp.), and dallisgrass (*Paspalum dilatatum*), ryegrass (*Lolium multiflorum*) and bird’s-foot trefoil (*Lotus corniculatus*). Native grasses are a relatively rare component of the pasture, but traces of saltgrass (*Distichlis spicata*), re-

sembling Bermuda grass, and creeping wildrye (*Leymus triticoides*), and meadow barley (*Hordeum brachyantherum*) have been detected. These native grasses (rather than native bunchgrasses) were historically typical of lowlands near the edge of the delta where groundwater is within reach of perennial grass roots in spring and early summer, particularly where soil alkali or salt content influences vegetation. Most native vegetation within pasture occurs as rushes and spikerushes. Intensive grazing on the site can mask the expression of terrestrial and wetland phases of pasture vegetation, and obscure the identity of some grasses and rushes. Relatively well-drained pastures lacking persistent periods of soil saturation tend to lack the associated marsh species of rushes and wetland grass species (Figure 3.4-1).

WETLAND VEGETATION AND HABITATS

EXISTING WETLAND LANDSCAPE. The site's wetlands are mostly non-tidal seasonal and perennial wetlands formed within agriculturally reclaimed historic freshwater marshes of the western Sacramento-San Joaquin delta.

Remnants of freshwater tidal marshes are distributed in narrow fringes along the outer margins of the levees. A large patch of mature tidal freshwater marsh habitat does exist, however, at the eastern end of Big Break at the historic mouth (delta) of Marsh Creek, adjacent to the west side of the Emerson Parcel. This mature freshwater tidal marsh is a local sample of possible future conditions of the restored marsh vegetation at the Dutch Slough site. Marsh Creek's banks also support continuous fringes of freshwater tidal marsh, but these are periodically disturbed by maintenance of flood conveyance capacity (dredging). The Contra Costa Canal is another feature supporting a fringe of freshwater marsh. The edges of this manmade tidal channel are periodically disturbed (by maintenance: desilting, devegetation) freshwater marsh habitats. The canal corridor borders the southern end of the project site.

The salinity range of the Dutch Slough tidal marshes (from Big Break eastward) is also generally very low, usually within the limits of physiological tolerance of most freshwater marsh species. They are effectively freshwater marshes with traces of soil salts (oligohaline marsh). Most of these effectively freshwater tidal marshes contrast with the brackish tidal marshes of Suisun Marsh, which usually become sufficiently saline in summer to inhibit the growth of salt-intolerant species or increase their mortality.

Nontidal freshwater wetlands, in contrast with the continuous fringes of tidal marsh, are distributed in large and small patches within diked reclaimed agricultural lands. Old marsh peat soils within reclaimed agricultural lands on the project site have subsided in large depressions well below sea level, making drainage difficult. Winter runoff from pastures floods these depressions, and they are also influenced by near-surface groundwater recharged from adjacent tidal sloughs during the growing season. The nontidal freshwater marshes correspond with these topographic depressions in subsided, porous, decomposed poorly drained peaty soils. They are generally saturated or flooded for most of the summer growing season. Their freshwater marsh vegetation also indicates that their soil salinity is a negligible factor for plant growth.



Flood-irrigated pastures of operational dairy ranch, Gilbert Parcel. Pasture includes variable transitions between wetland meadow and relatively well-drained terrestrial grassland. Vegetation is composed of nonnative forage grasses and weedy broadleaf plants, and some native rushes (dark green in photo), grasses, sedges, and spikerushes. In summer, pastures may alternate between wetter and drier phases of irrigation and grazing. Pastures are generally wet in the rainy season.



Figure 3.4-1

Flood Irrigated Pastures

Source: Grasseti Environmental

One exception to the prevalent low-salinity wetlands occurs in nontidal evaporation basins that support important seasonal wetlands of the project site. Flooded shallow pools and flats develop in winter on relatively impermeable clayey soils, often in patchy areas surrounding freshwater marsh. These seasonal wetlands act as evaporation basins, and expose relatively dry soil in spring and summer. These evaporation basins may concentrate soil salts (“alkali”) and select for salt-tolerant vegetation. Their distinctive vegetation contains elements of brackish marsh, playa, and alkali grasslands with vernal pools. They are informally called “alkali meadow” (see description below).

The distribution pattern of distinct wetland vegetation types and habitats within the Dutch Slough Restoration Project site, as interpreted and mapped based on 2004 conditions, are shown in Figure 2-10. These occupy extensive patches concentrated in topographic depressions at the north end of parcels, but also in artificial ditches throughout the irrigated pastures. The upper boundaries of some wetland types, such as non-tidal freshwater marsh and riparian woodland, are relatively clear. The boundaries of other wetland types, particularly seasonal wetlands such as seasonal ponds and “alkali meadow” (saline to alkaline seasonal wetlands dominated by grasses and forbs), like “irrigated pasture” are subject to variability in distribution between years. Acreages identified below should be interpreted as dynamic approximations, varying with the depth and duration of flooding.

FRESHWATER MARSH. Freshwater marsh refers to wetlands with emergent, rooted perennial vegetation in non-saline soils that are either flooded or saturated for most the growing season. The most familiar types of freshwater marshes in the Delta region are tule, cattail, or bulrush marshes, vegetation types with tall, linear stems or leaves. Broad-leaved plants may also be abundant in freshwater marshes. Freshwater marshes formerly dominated vast areas of the Sacramento-San Joaquin delta ecosystem, but are now reduced to habitat fragments, often narrow fringes of marsh bordering levees. Both tidal and non-tidal phases of freshwater marshes occur at the project site and vicinity, differing somewhat in composition, function, and habitat value. Both are predominantly tule vegetation. Freshwater tidal marsh constitutes the primary target vegetation and habitat for the project.

FRESHWATER NONTIDAL MARSH. (Figure 3.4-2) Freshwater nontidal marshes occur on the project site in undrained, subsided depressions where soils are submerged during the rainy winter season and during most or all of the summer growing season. Shallow (water less than 3 feet deep) emergent freshwater marshes are dominated by thick, tall, highly productive stands of tules (*Schoenoplectus acutus*, *S. californicus*; formerly *Scirpus*), and also cattails (*Typha* spp.). Disturbed freshwater marsh in ditches supports a higher proportion of cattails than stable freshwater marshes. Broad, deeply flooded areas that support open water most of the year, and develop emergent mud beds (draw-down) late in the growing season effectively alternate between seasonal ponds and freshwater marshes. Other locally abundant grass-like freshwater marsh species includes common spikerush (*Eleocharis macrostachya*), rabbit’s-foot grass (*Polypogon monspeliensis*) and dallisgrass (*Paspalum dilatatum*). Many marsh forbs occur in freshwater marsh, but tules or cattails usually dominate the vegetation. Characteristic forbs in nontidal freshwater marsh include cocklebur (*Xanthium strumarium*, a coarse annual), curly dock (*Rumex crispus*, nonnative perennial), and many marsh knotweed species (*Polygonum* spp., widespread native and nonnative broadleaf annuals and perennials). The upper ends of freshwater marsh gradients may be abrupt, steep edges of terrestrial vegetation, or they may grade into transitional vegetation of alkali meadow, riparian woodland, pasture, or blackberry thickets. Vegetation mapping completed by DWR, based on 2004 field conditions, estimated that 54 acres of nontidal freshwater marsh occur within the Dutch Slough Parcels. (DWR 2004a)



Freshwater nontidal marshes form in undrained topographic low areas, in muck or peaty soils. Above: extensive freshwater marsh bordered by mature California black walnut trees (riparian woodland) on levee of northwest Burroughs parcel in July 2005. Vegetation is variable and patchy, including tules, cattail, spikerush, marsh forbs. Below: Relatively isolated freshwater marsh within matrix of arid ruderal (weedy) vegetation, Emerson parcel. Vegetation is mostly tules, bordered by patches of willow, blackberry. (Vineyard and windbreak walnut trees in background).



Figure 3.4-2

Freshwater Nontidal Marshes

Source: Grassetti Environmental



Freshwater tidal marsh. Freshwater tidal marshes occur around the edges of the project site and adjacent Big Break shoreline. Vegetation and habitat types occurring there also represent habitat restoration objectives of the project. (a) low intertidal marsh zone, tule and mud bed (Big Break); (b) middle intertidal marsh zone, diverse assemblage of broadleaf flowering marsh plants, bulrush, spikerush, rush, and tule (Big Break).



Figure 3.4-3a
 Freshwater Tidal Marshes

Source: Grassetti Environmental



Freshwater tidal marsh (continued). (c) High intertidal freshwater marsh grades into middle and low marsh patches below, and lowland grassland above, at Big Break. High marsh gradient here includes (a) baltic rush, saltgrass, creeping wildrye, heliotrope, and Yerba Mansa. (d) Complete tidal wetland complex including gradients between low, middle, high tidal freshwater marsh and riparian woodland along Marsh Creek at Big Break.



Figure 3.4-3b

Freshwater Tidal Marshes

Source: Grasseti Environmental

FRESHWATER TIDAL MARSH. (Figures 3.4-3a and b) Freshwater tidal marsh refers to regularly flooded tidal marshlands with very low levels of soil salinity, tolerable by most freshwater species. The low intertidal marsh zone has soils flooded by daily tides, and is generally dominated by tall tules (*Schoenoplectus acutus*, *S. californicus*; formerly *Scirpus*), and occasionally several species of cattails (*Typha* spp.). Low marshes are highly productive, but support few species other than tules that tolerate deep, prolonged tidal flooding. The outer sides of levees around the Dutch Slough parcels support narrow fringes of low intertidal freshwater marsh. Low marsh vegetation may extend to shallow subtidal depths in some conditions, where it may compete (or out-compete) non-native submerged aquatic vegetation and displace invasive floating aquatic vegetation. Relatively few emergent plant species can tolerate the long flooding periods and depths of the low marsh zone, and competition from tules there. Tule marshes are generally not subject to invasion by non-native wetland weeds because they tend to overwhelm other species with their tall, dense shoot masses, below-ground network of stems and roots, and superior flood tolerance. Though native, they may even be considered “invasive” in some land use contexts (DiTomaso and Healy 2003).

Portions of the freshwater tidal marshes that are regularly flooded most of the month, but are emergent (soil above water level) for many hours each day, compose the middle intertidal marsh zone. The middle marsh zone is considerably more diverse in plant species, even though this zone also may be dominated by tules. This zone is rarer and less abundant than low marsh, since it often represents a more mature marsh condition, requiring long periods of peat accumulation or sediment deposition. The Dutch Slough, Ironhouse and City of Oakley Park parcels support very little of this tidal freshwater marsh type, but substantial patches do occur along Marsh Creek and some areas that are free from both rip-rap and woody riparian vegetation. Invasive non-native plants can also invade this species-rich freshwater tidal marsh zone, including yellow flag (*Iris pseudoacorus*), purple loosestrife (*Lythrum salicaria*), but these do not currently appear to be significant components of the middle marsh zone along Marsh Creek.

The middle marsh zone grades into the uppermost end of tidal freshwater marsh (high intertidal marsh zone) that is only occasionally flooded by tides or flood events, but it includes depressions that remain flooded after tides recede. Very little of this zone occurs sporadically in a very narrow area of the outer levee toe of Dutch Slough Parcels. It is well-developed locally along the Big Break shoreline (a natural and very local reference site), and is an important part of the project restoration design. The high marsh zone at Big Break is dominated by wire rush (*Juncus balticus*, syn. *J. arcticus*), creeping wildrye (*Leymus triticoides*), and include large patches of Yerba Mansa (*Anemopsis californica*), saltgrass (*Distichlis spicata*), and wild heliotrope (*Heliotropium curassavicum*). Rare plants of this zone include Suisun aster (*Aster lentus*) and rose-mallow (*Hibiscus lasiocarpus*). The endangered Suisun Marsh plants, Suisun thistle (*Cirsium hydrophilum* var. *hydrophilum*) and soft bird’s-beak (*Cordylanthus mollis* ssp. *mollis*) do not occur in freshwater tidal marshes of the Delta, and there is no evidence that they ever occurred there historically. Large thickets of non-native Himalayan blackberry (*Rubus discolor*) also invade high marsh, converting them to riparian scrub thickets. High freshwater marsh may naturally grade into lowland grasslands (dense, closed stands of saltgrass, creeping wildrye, heliotrope) or seasonal wetland transition zones, or it may end abruptly at the edges of steep levees or river banks eroded in terrestrial sediments.

The acreage of tidal freshwater marsh bordering the Dutch Slough Restoration Project parcel levees has not been quantified. No tidal marsh occurs within the project levees.

FLOATING AQUATIC VEGETATION (FAV). (Figure 3.4-4) Some vegetation extends over the open water surface, either as free-floating plants, or colonies extending from plants rooted in banks. Some floating aquatic vegetation is native (water-primrose; most *Ludwigia* species and subspecies), but most FAV consists of highly invasive non-native plants like water-hyacinth (*Eichornia crassipes*) that choke irrigation ditches of the project site where tules have been removed, or where canals are too deep to support tules. FAV also occurs along quiet sloughs, especially at the blind ends of sloughs. Whether native or non-native, abundant FAV is treated as a nuisance to boating. Even native FAV species may become overabundant and invasive in nutrient-rich waters of urban and agricultural watersheds with diminished tidal and freshwater outflows. FAV borders marshes along large sloughs and small tidal channels of the Dutch Slough area, and may accumulate as large wracks that disturb marsh vegetation by smothering it with decomposing masses of debris. It also is abundant to dominant in irrigation ditches. Because FAV mats are seasonal and unstable in terms of area and distribution, their total acreage has not been estimated; acreage estimates would be an annual variable.

SUBMERGED AQUATIC VEGETATION (SAV). (Figure 3.4-5) Submerged aquatic vegetation is treated as wetland vegetation in some broad wetland classifications, such as the U.S. Fish and Wildlife classification of wetlands (Cowardin 1979). Submerged aquatic plants have leaves and stems that are fully submersed for all or nearly all of their life-cycle, and often have root systems reduced to minimal anchorage structures in pond or river beds. There are many native SAV species, including pondweeds (*Potamogeton* species, and sago pondweed, *Stuckenia pectinatus*) and stoneworts (*Chara* spp., green algae structurally similar to vascular plants) that are highly valuable food plants for waterfowl, and nursery habitat for aquatic invertebrates and fish. SAV may form patches or beds of extensive bottom “canopy” habitat.

In the delta, non-native invasive SAV species overwhelmingly dominate and replace native SAV and naturally bare open-water slough beds. Brazilian waterweed, *Egeria densa*, is extremely competitive against native SAV, invasive, and capable of surviving at great water depths. It has structural characteristics that create exaggerated cover and shelter in tidal slough beds, favoring predatory non-native fish. For this reason, SAV as a whole in the Delta may be viewed unfavorably in aquatic restoration and management because of *Egeria*, which rapidly establishes in shallow or deep subtidal habitats, including restoration sites.

Shallow SAV (visible from some aerial photography) has not been estimated within the immediate vicinity of Dutch Slough, Emerson Slough and Little Dutch Slough, however *Egeria* is widespread and abundant there, particularly in vegetated shallow water of Big Break.



Floating aquatic vegetation (FAV), composed of mostly non-native invasive plants, covers otherwise open water at blind ends of tidal sloughs (Emerson Slough, above), and non-tidal ditches and ponds (Burroughs Parcel, below).



Figure 3.4-4

Floating Aquatic Vegetation

Source: Grassetti Environmental



Submerged Aquatic Vegetation (SAV) at the project site is predominantly highly invasive, non-native Brazilian waterweed, *Egeria densa*, which spreads as massive beds in deep quiet tidal sloughs and bays.

Figure 3.4-5
Submerged Aquatic Vegetation

Source: Grassetti Environmental



Alkali Meadow. Seasonal wetlands dominated by low-growing, salt-tolerant plants are described as “alkali meadow”, including plants associated with alkali vernal pools, grasslands, and brackish marshes. They occur in undrained flats that flood in winter and dry in summer, often in areas surrounding nontidal freshwater marsh. (Emerson parcel example shown at left)

Figure 3.4-6
Alkali Meadow

Source: Grassetti Environmental

“ALKALI MEADOW” AND SHALLOW SEASONAL PONDS, FLATS. (Figure 3.4-6) “Alkali meadow” is an informal habitat description describing variable types of seasonal wetland flats that concentrate salts (“alkali” refers to non-marine salts with different chemical properties) in surface soils after shallow water evaporates early in the growing season (spring or early summer). On the project site, alkali meadow may include relatively barren flats with sparse vegetation, annual grassland (Mediterranean barley, *Hordeum marinum*, often dominant), annual forb-dominated vegetation (brass-buttons, *Cotula coronopifolias*), or even perennial vegetation with brackish marsh plants (saltgrass, heliotrope, *Heliotropium curassavicum*). The composition of alkali meadow wetlands can be highly variable from site to site, and they may include species typically associated with alkali grassland, alkali sink, chenopod scrub, brackish marsh, and alkaline vernal pools. Species richness of seasonal wetlands associated with alkali meadow habitats can be high or low.

RIPARIAN WOODLAND AND SCRUB. (Figure 3.4-7) Within freshwater marshes like Big Break, and along levees, woody shrubs form dense thickets with canopies well above the marsh surface. Riparian scrub thickets are usually associated with higher, sloping, better-drained marsh edges or topographic high areas, such as levee remnants, or locally elevated flood deposits. They may occur along shorelines of ponds, or banks of channels, in tidal or non-tidal freshwater habitats. Willow thickets, and dead branches or trees (snags) within riparian woodland provide very important habitat for a wide range of wildlife species. During extreme floods, dense and tall riparian willow thicket canopies may partially remain above water levels, and trap debris, sediment, and act as baffles (permeable barriers) to wave energy propagated across open water.

Wild California black walnut trees (*Juglans californica* ssp. *hindsii*) of mature size are widespread along the outer levees of the Dutch Slough Restoration Project parcels, and are particularly abundant along Emerson Slough and Little Dutch Slough. This species was a component of historic riparian forests of the Delta, formed on well-drained flood sediments of wide natural river levees. “Old growth” stands of riparian forest are effectively extinct as a functional part of the Delta ecosystem, but naturally recruited “second-growth” woodlands composed of walnuts even when limited to narrow levees, provide some important riparian woodland habitat. Most mature native walnuts along the Emerson and Little Dutch Slough levees are rooted close to the high tide line, probably originating as floating seeds. Other than willows and walnuts, other woody native species of Delta riparian woodlands are relatively scarce at the project site. Non-native Himalayan blackberry thickets are common in the riparian zone of levees and throughout the pastures within the levees. Planted windbreak walnut trees along the edges of the Emerson Parcel vineyard (terrestrial setting) are not equivalent to riparian (shoreline) woodland.

DWR mapped 11.4 acres of riparian scrub and woodland vegetation in shoreline wetland settings (DWR 2004a). This estimate segregates patches of Himalayan blackberry (nonnative shrub thickets often in riparian vegetation) that may also occur in terrestrial habitats; some separately mapped blackberry thickets adjoining wetlands are presumably riparian vegetation as well. Blackberry thickets are distinguished as a vegetation type primarily because they are easy to identify and map from aerial photographs, and because they are difficult to assign exclusively to riparian or terrestrial vegetation except by interpretation in local landscape context.

TERRESTRIAL VEGETATION AND HABITATS.

CROPLAND, LANDSCAPED, AND DEVELOPED AREAS. The intensively developed areas on the project site include vineyards (European wine grapes) planted on ancient dune soils, former dairy industrial buildings and operational areas, miscellaneous farm buildings, or residences with ornamental landscaping or derelict landscaping including old windbreak trees. The Burroughs parcel supports extensive linear and isolated windbreak tree plantings, composed of mature, large, old native and non-native trees. These historic windbreak plantings are similar to those of former ranches in the project vicinity (Dal Porto North, Dal Porto South, Leshar, Biggs parcels). They include mature cottonwood (*Populus fremontii*, native), blue gum (*Eucalyptus globulus*, nonnative), fig (*Ficus carica*, non-native, apparently not spreading from plantings), elms (*Ulmus pumila*, *Ulmus* sp.; nonnative), black locust (*Robinia pseudoacacia*, nonnative, spreading), and California black walnut (*Juglans californica* ssp. *hindsii*, native).

Mature date palms (*Phoenix canariensis*, non-native), silver maple (*Acer saccharinum*, non-native) and sycamore (*Platanus occidentalis*, native) are also documented on the project site (DWR 2004a). The Emerson and Gilbert parcels have relatively few windbreak/landscape trees in the open pasture areas; most are clustered near old ranch and dairy buildings at the south end. Large, old trees are not natural components of native vegetation, but they have important effects on wildlife habitat (particularly broken-top, dead, dying standing trees with cavities), as discussed below.

RUDERAL (WEEDY) TERRESTRIAL VEGETATION. (Figure 3.4-8) Ruderal terrestrial vegetation occurs sporadically, and is most frequently associated with sandy well-drained soils, roadsides, dry levee slopes, and areas that were formerly used intensively in dairy operations or equipment/storage areas. Fields with recent history of discing also tend to support rank weedy vegetation. Mapping of ruderal vegetation on site corresponds well with the distribution of disturbed “sand mound” (ancient dune) deposits, but many disturbed soils on site support weedy vegetation.

Ruderal vegetation of the site has variable composition, including noxious invasive weeds such as mallow (*Malva neglecta*), bull thistle (*Cirsium vulgare*), bindweed (*Convolvulus arvensis*), poison hemlock (*Conium maculatum*), wild lettuce (*Lactuca serriola*), tumbleweed (*Salsola tragus*), many non-native annual grasses (including oats, *Avena sativa*; ripgut brome, *Bromus diandrus*; hare barley, *Hordeum murinum*). Some native annuals such as spikeweed (*Centromadia pungens*) and willowherb (*Epilobium brachycarpum*, *E. spp.*) are also common in ruderal vegetation. Levees that are periodically disturbed by maintenance activities surround all Dutch Slough parcels with persistent seed sources of terrestrial weeds.

REMNANT ANCIENT INTERIOR DUNE HABITATS. (Figure 3.4-9) Though mapped as ruderal vegetation and vineyards, the low-lying sands of the project site have substantial, distinctive biological resource attributes relevant to restoration (project objectives) and also potential for some sensitive species. The Emerson and Burroughs parcels contain substantial remnants of low-lying ancient stabilized dunes, related to the same formation that includes Antioch Dunes and many of the sandy soils of the project vicinity (See Section 3.3, Geology and Soils). The early historic vegetation of these largely stabilized, ancient, interior dunes was perennial grassland, oak woodland, and local “blowout” areas (naturally disturbed, unstable wind-erosion and depositional sites, or river-cut sand cliffs, within stabilized dunes) that supported the distinctive dune species surviving at the Antioch Dunes National Wildlife Refuge. Similar elevated mounds of ancient dune remnants occurred within former pastures of nearby East Cypress corridor subdivisions. These dune remnants are not formed or sustained by modern river sand sources.



Riparian woodland and scrub at the project site occur along the borders of tidal and nontidal freshwater marshes, Marsh Creek (shown above), and levees along Dutch Slough, Emerson Slough, and Little Dutch Slough. Live and dead trees (snags) both provide important habitat (shown below). Willows are most abundant along marsh edges, and California walnuts mixed with willows (see Figure 3.6-2, nontidal freshwater marsh) are most abundant along levee edges in existing local riparian woodland.



Figure 3.4-7

Riparian Woodland

Source: Grasseti Environmental



Ruderal (weedy, disturbed) terrestrial habitats of the project site are variable, and occur in derelict arid agricultural land, derelict industrial dairy operation areas, levees, roadsides, and similar disturbed areas that grade into areas mapped as pasture. Tumbleweeds, spikeweeds, and annual grasses are abundant, particularly in sandy soils at higher elevations.



Figure 3.4-8

Ruderal

Source: Grasseti Environmental



Ancient Dune Habitats. “Sand mound” (sandy soils of ancient dunes) vegetation at the project site, support an old vineyard and weedy nonnative plants. The disturbed artificial sandy road embankment at the vineyard (yellow arrow) locally supports small populations of several native sandy soil and dune plants.



Figure 3.4-9

Ancient Dune Habitats

Source: Grassetti Environmental

The dune remnants at the Emerson Parcel are partly converted to vineyard, and the rest are dominated by non-native weedy vegetation and trees, rather than the characteristic native vegetation of disturbed blowouts in ancient interior dune remnants at Antioch dunes, or upland dune soil “sand mounds” of former grazed lands in the project vicinity. Past cattle grazing and long-term growth of nitrogen-fixing, non-native trees such as black locust (*Robinia pseudoacacia*) appear to have altered the soil properties of the upper soil horizons of the ancient dune soil remnants at the Emerson Parcel, enriching them with organic matter and nutrients. Native dune species are lacking or extremely scarce on the existing remnant dune soils of the Emerson Parcel.

Elevated soil organic matter and nutrients of the relict dune soils in historic pasture at Emerson Parcel have apparently promoted persistent dominance by invasive non-native vegetation. The subsoil of the relict dune areas, however, are likely to support relatively intact mineral dune sand that could potentially support native dune vegetation if exposed, and thus has some biological resource value as potential restorable habitat for a suite of sensitive species and uncommon plant communities (see Special-status plants, Special-status wildlife, below). This potential is indicated by incidental recent creation of a localized strip of artificial dune habitat caused by road maintenance on sandy soils of the Emerson Parcel vineyard: the roadside berm formed by side-cast sandy subsoil that was scraped from the road bed was spontaneously colonized by two native local dune species: native Chamisso’s bush lupine (*Lupinus chamissonis*, a characteristic dune shrub) and a perennial dune evening primrose (*Oenothera deltoides* ssp. *dentata*) related and somewhat similar to the endangered Antioch Dunes evening-primrose (*O. d* ssp. *howellii*). Small, persistent populations of both native dune plants are present in existing conditions along the vineyard roadside, indicating the ability to regenerate native dune vegetation locally.

Recent surveys of similar “sand mound” ancient dune remnants at adjacent, similar parcels (now eliminated in residential subdivisions) have revealed remnants of the local dune flora, and suggest the potential or historic vegetation of large exposures of ancient dune soils at the Emerson Parcel. The sand mound vegetation on similar parcels east of the project site supports a sand-associated local native flora similar but not identical with that of Antioch Dunes. The original vegetation of the Emerson Parcel sand mounds (Delhi soils) may have been intermediate in composition between Antioch Dunes and sand mounds to the east, which support widespread species such as California croton (*Croton californica*), telegraph weed (*Heterotheca grandiflora*), Kellogg’s spikeweed (*Deinandra kelloggii*), slender buckwheat (*Eriogonum gracile*), small-flowered evening primrose (*Camissonia micrantha*), and common lessingia (*Lessingia glandulifera*).

The Antioch Dunes flora includes other species such as Chamisso’s and silvery bush lupine (*Lupinus chamissonis*, *L. albifrons*), nude buckwheat (*Eriogonum nudum*), and deerweed (*Lotus scoparius*). It is unknown whether the rare, endangered plants of Antioch Dunes naturally occurred in the low-lying ancient dune remnants of the project site in early historic, pre-agricultural times; there are no records of these species by the time they were distinguished taxonomically, long after agriculture modified the vegetation.

TERRESTRIAL AND WETLAND WILDLIFE

WILDLIFE OF PASTURES AND RUDERAL TERRESTRIAL HABITATS. The Dutch Slough Restoration Project and Related Project sites support extensive cattle-grazed or hay-farmed pastures and weedy habitats with abundant wildlife, primarily birds. Similar open grassland habitats occur on agricultural lands east of the Burroughs parcel. Mammalian species common in these habitats include rodents (ground squirrels, *Spermophilus beecheyi*; pocket gophers, *Thomomys bottae*; and mice, *Mus musculus*,

Peromyscus sp., *Microtus californicus*, *Reithrodontomys megalotis*); coyote (*Canis latrans*); black-tailed jackrabbit, (*Lepus californicus*), red fox (*Vulpes vulpes*), opossum (*Didelphis virginiana*), and raccoon (*Procyon lotor*).

Small mammals and insects are prey for numerous raptor species (hawks and owls) that actively forage over the extensive grassland habitat, especially well-drained or arid areas. Barn owls (*Tyto alba*), great horned owls (*Bubo virginianus*), red-tailed hawk (*Buteo jamaicensis*), red-shouldered hawk (*Buteo lineatus*), American kestrel (*Falco sparverius*), northern harrier (*Circus cyaneus*), white-tailed kite (*Elanus caeruleus*), and Swainson's hawk (*Buteo swainsoni*) have been reported from the project site in surveys conducted by DWR (DWR 2004b). They also have been consistently reported in surveys of adjacent ranchlands (Sycamore Associates 2005), and are evidently established in the project vicinity. Burrowing owl (*Athene cunicularia*) populations, while not documented on the project site in 2005, occur in the project vicinity and utilize the same types of habitats present for foraging and nesting. Many perching birds, including tricolored blackbird (*Agelaius tricolor*), Brewers blackbird (*Euphagus cyanocephalus*), western meadowlark (*Sturnella neglecta*), golden-crowned and white-crowned sparrows (*Zonotrichia atricapilla*, *Z. leucophrys*), forage in pastures on the site. California quail (*Callipepla californica*) and (non-native) ring-necked pheasant (*Phasianus colchicus*) are abundant in ruderal areas with more vegetation cover and seed production. Western fence lizards (*Sceloporus occidentalis*) are common in dry ruderal habitats. The moist or wet irrigated pastures of the Gilbert parcel, surrounded by permanently wet ditches, support large populations of Pacific treefrogs (*Pseudacris regilla*). Long-billed curlew (*Numenius americanus*), great egrets (*Casmerodius albus*), snowy egrets (*Egretta thula*), and great blue herons (*Ardea herodias*) forage in the irrigated pastures as well as freshwater marshes on the site.

WILDLIFE OF NONTIDAL FRESHWATER MARSHES. Nontidal freshwater marshes (including shallow to deep water areas seasonally present within them) support locally common to abundant wading birds (great egret, snowy egret, great blue heron), waterfowl (mallard, *Anas platyrhynchos*; common moorhen, *Gallinula chloropus*; cinnamon teal, *Anas cyanoptera*) and shorebirds (dunlin, *Calidris alpina*; greater yellowlegs, *Tringa melanoleuca*), and wetland perching birds (marsh wren, *Cistothorus palustris*; red-winged blackbird, *Agelaius phoeniceus*). Suitable habitat for a large number of additional waterbird species exists on the estimated 54 acres of nontidal freshwater marsh on site. The freshwater marshes and ponds within the project site support northwestern pond turtles (*Emys marmorata*; see special-status wildlife species) that serve as an indicator of habitat quality for other native amphibians and reptiles inhabiting freshwater marshes. A juvenile pond turtle was detected on the site, suggesting a local breeding population (DWR, Laura Patterson, pers. comm. 2005) suggesting that some refuges from non-native bullfrog (*Rana catesbeiana*) likely exist within at least some freshwater marsh habitat locations on site. This indicates relatively high potential for other wetland-dependent wildlife (reptiles, amphibians) to establish breeding populations in the isolated “islands” of freshwater marshes within the project site. The irrigation ditches of the project site, however, support abundant populations of predatory bullfrogs. The ditch network is likely to act as bullfrog dispersal corridors, enabling them to access larger blocks of freshwater marsh.

WILDLIFE OF TIDAL FRESHWATER MARSH. The tidal freshwater marshes that fringe the levees of the project site support river otter (*Lontra canadensis*), muskrat (*Ondatra zibethicus*), northwestern pond turtles, and snakes (gopher snake, *Pituophis melanoleucus*; garter snakes, *Thamnophis* sp.; racers, *Masticophis lateralis*). These species have been reported (trapped or observed) from lower Marsh Creek, and are likely to occur throughout the tidal marsh fringes of the project site. In addition, wading birds and wetland perching birds typical of the nontidal freshwater marshes of the site occur in fringing tidal marshes. Double-crested cormorants (*Phalacrocorax auritus*) and diving and dabbling ducks occur in the adjacent sloughs. Virginia rail (*Rallus limicola*), sora (*Porzana carolina*), and California black rail (*Laterallus jamaicensis coturniculus*; see special-status species, below) are known to occur in tidal

marshes around the project site. Beaver (*Castor canadensis*) and mink (*Mustela vison*) have been reported from the lower San Joaquin river marshes, and may occur at least intermittently at the project site boundaries. Surveys of the tidal Contra Costa Canal, bordering the southern end of the site, also reported the presence of northwestern pond turtles, racers, gopher snakes, garter snakes and bullfrogs. The resident wildlife populations of fringing tidal marshes are likely to serve as local founder population sources for marsh restoration.

WILDLIFE OF ALKALI MEADOW AND SEASONAL WETLAND FLATS. The shallow seasonally flooded alkali meadow and related seasonal wetland flats and shallow seasonal ponds of the site provide local habitat for dabbling ducks and shorebirds. The invertebrate fauna of the local alkali meadow and flats is not known. The seasonal pools and alkali meadows of adjacent ranches were surveyed for special-status branchiopods (fairy shrimp, tadpole shrimp) and diving beetles because they were considered to be suitable habitat, but only wide-ranging aquatic invertebrates, important for food webs (midge larvae, copepods, cladocerans, corixids, etc.) were found (Arnold 2005, Dexter 2004). No special-status branchiopods (specialized vernal pool invertebrates, many of which are special-status species) have been detected in surveys of adjacent ranchlands, but habitats are potentially suitable. Surveys of similar alkali meadows and shallow seasonal wetland flats on adjacent parcels indicated abundant production of Pacific tree frogs (important prey item for snakes, wading birds). The alkali meadows and shallow seasonal ponds are unlikely to support bullfrogs because of the variable seasonal drainage or desiccation of this habitat in summer. The on-site status of other amphibians species adapted to seasonal wetlands, such as California tiger salamander (*Ambystoma californiense*, see special status species, below) is unknown. Dabbling ducks are likely to utilize rich seasonal production of small aquatic invertebrates for foraging in shallow pools. Tricolored blackbirds may also utilize seasonally flooded alkali meadow habitats adjacent to pastures.

WILDLIFE OF RIPARIAN SCRUB AND WOODLAND. Many bird species use existing riparian habitats. Generalist perching birds that seek shrub or tree canopies use riparian areas, and birds that favor riparian habitats have also been observed frequently in existing riparian woodland and scrub thickets of the site, including many sparrow and warbler species (DWR 2005). Great egrets roost in riparian thickets, favor mature, decadent stands with large branches, dead-top trees and snags (for example, see Figure 3.4-7). Raptors that forage over water or marsh, such as osprey (*Pandion haliaetus*), white-tail kite, and northern harrier (see species of concern, below) are likely to use mature riparian woodland similarly. A number of raptors use this on-site habitat for nesting, including Swainson's hawk, red-shouldered hawk, red-tailed hawk, and great horned owl.

WILDLIFE OF LANDSCAPED AREAS AND BUILDINGS. Barn owls inhabit the developed areas at the south end of the Emerson and Burroughs parcels, where derelict dairy buildings; large, old, and decadent windbreak tree groves; and ruderal vegetation occur together. Bats and swallows (DWR 2004b) have been observed near old dairy buildings, but their local distribution and abundance have not been determined. Swift species may utilize crevices in old buildings as well; DWR bird surveys did report white-throated swifts (*Aeronautes saxatalis*) from the project site (DWR 2004b). Raccoon sign is also evident near old dairy buildings. Commonly, feral domestic cats (*Felis catus*) occur in developed areas, and Norway rats (*Rattus norvegicus*) have been reported (Sycamore Associates 1999). Small mammals (mice, voles) are also likely to occur in old dairy areas. Many habitat-generalist perching birds, including brown-headed cowbirds (*Molothrus ater*), European starlings (*Sturnus vulgaris*), sparrows, American crows (*Corvus brachyrhynchos*), scrub jays (*Aphelocoma coerulescens*), and northern mockingbirds (*Mimus polyglottus*), are common throughout the area and have been observed at the site by multiple observers.

SPECIAL-STATUS TERRESTRIAL AND WETLANDS SPECIES

“Special-status” species is a general term that refers to any species or population segment with substantial, legal, policy, or scientifically valid concern for conservation. A “population segment” refers to geographically or genetically distinguished portion of species, subspecies, or variety. Special status species generally include: federally listed or state-listed endangered, threatened, and candidate species; state-listed “rare” species; species identified as “species of concern” in federal endangered species recovery plans; species ranked as “species of special concern” by the California Department of Fish and Game; species listed as “fully protected” by the California Department of Fish and Game; species ranked as rare, threatened, endangered, or “watch list” in scientifically peer-reviewed non-governmental conservation organizations; and species for which substantial evidence (“fair argument”) exists to justify conservation significance at a local, regional, or statewide scale, such as evidence of rarity from published scientific surveys, floras, or research. The species list below (Table 3.4.1) was generated from these sources as well as DFG’s California Natural Diversity Database and Special Animals and Special Plants lists, and lists generated from the USFWS website. The project site is located in the southeast corner of the Jersey Island and the northeast corner of the Brentwood USGS quad maps. The government lists were generated for these two quads as well as the two quads to the east, Bouldin Island, and Woodward Island.

Table 3.4.1: Species List for Dutch Slough Area

| Species | Status (State/ Federal/ Other*) | Distribution | Habitat | Likelihood of occurrence in project area | Evaluated in EIR? |
|--|--|---|---|---|-------------------|
| PLANTS | | | | | |
| <i>Astragalus tener var tener</i> Alkali milk-vetch | / / CNPS 1B | CA endemic. The historical distribution includes the S. Sacramento Valley, N. San Joaquin Valley, and the E. San Francisco Bay Area. | Associated with clay soils of alkaline flats and meadows, valley and foothill grasslands, and alkaline vernal pools. The blooming period is March through June. | Very low. Presumed extirpated from Contra Costa County. Surveys in 2004 did not find it on the project site. | Yes |
| <i>Atriplex cordulata</i> Heartscale | / / CNPS 1B | Historical distribution was valley and foothill grasslands throughout the Sacramento and San Joaquin Valleys and the San Francisco Estuary. | Saline or alkali areas in chenopod scrub, or sandy valley and foothill grasslands. Also alkali soils within and adjacent to seasonal marsh. | Unlikely. Not known from project area. | No |
| <i>Atriplex coronata var coronata</i> Crownscale | / / CNPS 4 | Central Valley and southern Coast Ranges | Chenopod scrub, alkali areas, valley and foothill grassland; vernal pools. Blooms Mar-Oct. | Low, though known to occur near the project site, in similar habitats. Surveys in 2004 did not find it on the project site. | Yes |
| <i>Atriplex depressa</i> Brittlescale | / / CNPS 1B | Endemic to the lower Sacramento and upper San Joaquin valleys and greater San Francisco Bay-Delta. | Chenopod scrub, valley and foothill grassland, meadows, alkaline playas, and vernal pools; occurs in relatively barren alkaline areas which are drier than vernal pools | Unlikely. Not known from project area. | No |
| <i>Atriplex joaquiniana</i> San Joaquin saltbush | / / CNPS 1B | W side of the Central Valley from Glenn to Merced counties and in small valleys of the inner Coast Ranges. | Clay, often highly saline, soils in alkaline grasslands and alkali meadows or on the margins of alkali scrub. | Low, though known to occur in Contra Costa County. Surveys in 2004 did not find it on the project site. | Yes |

| Species | Status (State/ Federal/ Other*) | Distribution | Habitat | Likelihood of occurrence in project area | Evaluated in EIR? |
|---|--|--|--|--|-------------------|
| <i>Blepharizonia plumosa</i> <i>var plumosa</i> Big tarplant | / / CNPS 1B | CA endemic. The historical distribution extended from the NW San Joaquin Valley to the E SF Bay region. | Occurs on dry hills and grassy plains. Flowers from July through October | Low, though known to occur in Contra Costa County. Surveys in 2004 did not find it on the project site. | Yes |
| <i>Carex comosa</i> Bristly sedge | / / CNPS 2 | Widespread through US and Canada. | Invades gaps in marshes, lake shores, and wet meadows, freshwater tidal marshes; often in shallow water or on emergent stumps, floating logs, and floating mats of vegetation. | Low, though there is one CNDDDB occurrence in quad adjacent to project area. | No |
| <i>Centromadia parryi</i> ssp. <i>congdonii</i> Congdon's tarplant | / / CNPS 1B | Originally distributed through the central and southern portions of western California. | Alkaline grasslands. Blooms June through November. | Unlikely. Not known from project area. | No |
| <i>Cordylanthus mollis</i> ssp. <i>mollis</i> soft bird's-beak | /E/ CNPS 1B | Historically found in high tidal marshes along the Petaluma and Napa rivers through the Carquinez Strait to Suisun Bay and the San Joaquin-Sacramento River Delta. | Soft bird's-beak is found predominantly in the upper reaches of salt grass/pickleweed marshes at or near the limits of tidal action. Blooms July-September. | None. No appropriate habitat in the project area. Surveys in 2004 did not find it on the project site. | No |
| <i>Erodium macrophyllum</i> Round-leaved filaree | / / CNPS 2 | Central Valley, central and south coast and southern Coast Ranges. | Typically grows in valley and foothill grasslands in open habitat on friable clay soils. | Unlikely. No suitable habitat (soils) on site. Surveys in 2004 did not find it on the project site. | No |
| <i>Eschscholzia rhombipetala</i> Diamond-petaled California poppy | / / CNPS 1B | Known historically from the inner Coast Ranges and eastern SF Bay region. | Found on nearly barren areas of clay soils. | Highly unlikely. Only known populations are from Livermore National Laboratory and the Car-rizo Plain. Surveys in 2004 did not find it on the project site. | No |
| <i>Hibiscus lasiocarpus</i> Rose-mallow | / / CNPS 2 | Sacramento, San Joaquin Delta. | Well-developed freshwater marsh areas, moist gradual sloping riverbanks, and on low peat islands of the Delta Blooms in August and September. | Unlikely. One historic occurrence at Dutch Slough site, though not currently present. Project unlikely to impact the species. Surveys in 2004 did not find it on the project site. | No. |
| <i>Isocoma arguta</i> Carquinez goldenbush | / / CNPS 1B | Endemic to California; known only from Solano, Contra Costa and San Luis Obispo counties. | Valley Grassland, usually occurs in alkaline soils, flats, lower hills | Unlikely. Only Contra Costa County occurrences were along Carquinez Straits. Surveys in 2004 did not find it on the project site. | No |
| <i>Lasthenia conjugens</i> Contra Costa gold-fields (E) | /E/ CNPS 1B | Historically, central CA coast, southern SF Bay, base of Mt. Diablo, inner Coast Range around San Pablo and Suisun bays, and the western Delta. | Vernal pools within open grassy areas in woodlands and valley grasslands from sea level to 1,500 feet. | Unlikely. Very little suitable habitat and not known from near project area. | No |

| Species | Status (State/ Federal/ Other*) | Distribution | Habitat | Likelihood of occurrence in project area | Evaluated in EIR? |
|---|--|--|--|---|-------------------|
| <i>Lathyrus jepsonii</i> var. <i>jepsonii</i> Delta tule pea | / / CNPS 1B | Occurs on the Delta islands of the lower Sacramento and San Joaquin Rivers and westward through Suisun Bay, Suisun Marsh, Napa River marshes, and the wetlands around south San Francisco Bay. | Occurs along sloughs, riverbanks, and levees affected by tidal fluctuations. Usually near the water's edge on the outboard side of tidal slough levees, but also occupies creek and slough banks in tidal marshes. | Unlikely. Plant is conspicuous and it was not found during plant surveys in 2004. Surveys in 2004 did not find it on the project site. | No |
| <i>Lilaeopsis masonii</i> Mason's lilaeopsis | Rare/ / CNPS 1B | The intertidal zone of freshwater and brackish marshes of the Delta, Suisun Bay, Suisun Marsh, Mare Island, Carquinez Straits, and the Napa River. | Restricted to the littoral zone of freshwater and brackish marshes. It is most common on actively eroding slough banks, wave cut beaches, or earthen levees with a clay substrate. | Possible. Not found during surveys, but populations fluctuate with bank conditions. Surveys will be conducted again before project construction. Surveys in 2004 did not find it on the project site. | Yes |
| <i>Limosella subulata</i> Delta mudwort | / / CNPS 2 | Intertidal zone of Suisun Marsh and the Delta. | Grows along eroding banks inundated by the tide, especially along edges of channel islands where competition is limited. Blooms from May - August | Possible. Not found during surveys, but surveys will be conducted again before project construction. Surveys in 2004 did not find it on the project site. | Yes |
| <i>Oenothera deltoidea</i> ssp. <i>howellii</i> Antioch Dunes evening-primrose | T/E/ CNPS 1B | Endemic to the Antioch Dunes, south of the confluence of the Sacramento and San Joaquin Rivers. Not known from any other locations. | Occurs in loose sand and semistabilized dunes and requires freshly disturbed sand for the establishment and survival of seedlings. Blooms March-May and in September. | Not present. The primrose on site is <i>O. d. cognata</i> , which has no status as a rare plant. | No |
| <i>Polamogeton zosteriformis</i> Eel-grass pondweed | / / CNPS 2 | Occurs throughout Canada and N half of US, including scattered areas of CA. | Marshes and swamps. water from shallow to >12' deep; in soft sediment soil | Unlikely. Local CNDDDB records are from >50 years ago. Surveys in 2004 did not find it on the project site. Surveys in 2004 did not find it on the project site. | No |
| <i>Scutellaria galericulata</i> Marsh skullcap | / / CNPS 2 | Throughout US and Canada.. In CA, most occurrences are in NE part of state. | Wet meadows and thickets, shores. Blooms June to September. | Unlikely. Appropriate habitat does not occur on site. Local CNDDDB records are from Middle River and channel islands in large Delta channels. | No |
| <i>Scutellaria lateriflora</i> Blue skullcap | / / CNPS 2 | Throughout US and Canada. | Wet meadows and thickets, shores. | Unlikely. Local CNDDDB record is from >100 years ago. Surveys in 2004 did not find it on the project site. | No |
| <i>Symphiotrichum lentum</i> (<i>Aster lentus</i>) Suisun aster | / / CNPS 1B | Sacramento – San Joaquin Delta, Suisun Bay, Suisun Marsh, and the marshes associated with the Napa River north of San Pablo Bay. Populations have been documented in Sacramento, San Joaquin, Solano, Contra Costa, and Napa counties. | Occurs along brackish sloughs and riverbanks affected by tidal fluctuations, and within tidal wetlands. | Present. Known from project site. | Yes |

| INVERTEBRATES | | | | | |
|---|--|---|--|---|-------------------|
| Species | Status (State/ Federal/ Other*) | Distribution | Habitat | Likelihood of occurrence in project area | Evaluated in EIR? |
| <i>Apodemia mormo langei</i> Lange's metalmark butterfly | /E | Currently known only from Antioch Dunes. | Always near larval host plant, naked-stem buckwheat (<i>Eriogonum nudum auriculatum</i>) which requires dunes. | Unlikely. Remaining sandy areas are not suitable for host plant. | No |
| <i>Branchinecta conservatio</i> Conservancy fairy shrimp | /E | Currently, scattered populations from Butte to Ventura counties. | Large, deep, cool-water vernal pools in annual grasslands. | Unlikely. No known occurrences in Contra Costa County. Pools on site are not appropriate habitat. | No |
| <i>Branchinecta longiantenna</i> longhorn fairy shrimp | /E | Eastern margin of central Coast Ranges from Contra Costa to San Luis Obispo counties. | Small, clear pools in sandstone rock outcrops or clear to moderately turbid pools with clay or grass bottoms. | Unlikely. Pools on site are not appropriate habitat. | No |
| <i>Branchinecta lynchi</i> vernal pool fairy shrimp | /T | Oregon and Central Valley and areas of southern CA | Variety of vernal pool habitats from smaller, clear, sandstone pools to large, turbid, alkaline valley grassland pools, | Low. Alkaline pools may be potential habitat. | Yes |
| <i>Branchinecta mesovallensis</i> Midvalley fairy shrimp | None | Central California. | shallow vernal pools, vernal swales and various artificial ephemeral wetlands | Possible. Species is fairly common and widespread, so project is not a threat to the species | No |
| <i>Desmocerus californicus dimorphus</i> valley elderberry longhorn beetle | /T | Streamside habitats below 3,000 feet throughout the Central Valley. | Riparian and oak savanna habitats with elderberry shrubs; elderberry is the host plant. | Possible. At least two elderberries (<i>Sambucus racemosa</i>) on project site. | Yes |
| <i>Elaphrus viridis</i> Delta green ground beetle and Critical habitat for Delta green ground beetle | /T | Currently known only from the greater Jepson Prairie area of Solano County. | Grassland-playa pool matrix; edges of pools, trails, roads, ditches, and surrounding grasslands. | Unlikely. Not known from project area. | No |
| <i>Hygrotus curvipes</i> Curve-footed hygrotus diving beetle | None | Known only from Contra Costa, Alameda, and northwest San Joaquin counties. | Occur primarily in temporary, still, alkaline ponds from late winter, to early summer | Possible. Only occurrence in CNDDB is the type locality (unknown year) from Oakley. | Yes |
| <i>Lepidurus packardii</i> vernal pool tadpole shrimp | /E | Central Valley of California from Shasta County to Tulare County. | Vernal pools and swales containing clear to highly turbid waters. These pools are most commonly located in grass bottomed swales of unplowed grasslands in old alluvial soils underlain by hardpan, or in mud-bottomed pools containing highly turbid water. | Unlikely. No true vernal pools on site. | No |
| <i>Lindieriella occidentalis</i> California linderiella | None | Central Valley of California. | Prefer large, fairly clear vernal pools and lakes. However, they can survive in clear to turbid water with pH from 6.1 to 8.5, and they have been found in very small pools. | Possible. Species is fairly common and widespread, so project is not a threat to the species. | No |

| Species | Status (State/ Federal/ Other*) | Distribution | Habitat | Likelihood of occurrence in project area | Evaluated in EIR? |
|---|--|---|---|---|-------------------|
| <i>Lytta molesta</i> Molestan blister beetle | None | Central California. | Vernal pools | Unlikely. No true vernal pools on site. | No |
| <i>Perdita scitula antiochensis</i> Antioch andrenid bee | None | Antioch Dunes. | Dune habitats. Collect pollen from just a few species. | Unlikely. Pollen plants are not found on project site. Species may be extinct. | No |
| AMPHIBIANS AND REPTILES | | | | | |
| <i>Ambystoma californiense</i> California tiger salamander | SC/T | From Sonoma County and the Colusa-Yolo County line, south to Tulare County. In the Coast Range, it occurs from Santa Cruz County south to Santa Barbara County, California. | Primary habitat is annual grasslands, and oak woodlands, but vernal pools and stock ponds in the vicinity are crucial to breeding. | Possible. Known throughout Contra Costa County. | Yes |
| <i>Rana aurora draytonii</i> California red-legged frog | SC/T | Historically from Redding to NW Baja California; in the Central Valley, the SF Bay area, and along the coast. Today found primarily in drainages of the central Coast Ranges. | Relatively shallow, slow moving water in streams, ponds, ditches. | Unlikely. Closest known populations are south of Antioch in Diablo foothills. | Yes |
| <i>Anniella pulchra pulchra</i> Silvery legless lizard | SC/ | Interior ranges from Contra Costa to San Diego counties. | Found primarily in areas with sandy or loose organic soils or where there is plenty of leaf litter. | Low. Potential habitat on Emerson parcel. | Yes |
| <i>Emys (=Clemmys) marmorata</i> western pond turtle | SC/ | Common in waterways throughout lower elevations of California. Northwestern and southwestern subspecies overlap throughout the Delta and Central Valley. | Ponds, marshes, rivers, streams, irrigation canals with muddy or rocky bottoms in woodlands, grasslands, and open forests. | Present. Species is known to occur, and breed, in the project area. | Yes |
| <i>Masticophis lateralis euryxanthus</i> Alameda whipsnake | T/T | Restricted to Alameda and Contra Costa counties; fragmented into 5 disjunct populations throughout its range. | Valleys, foothills, and low mountains associated with northern coastal scrub or chaparral habitat; requires rock outcrops for cover and foraging. | Low. No scrub or rocky habitat in project area. | No |
| <i>Thamnophis gigas</i> giant garter snake | E, FP/E | Central Valley from Fresno to Butte counties. | Sloughs, canals, low gradient streams and freshwater marsh habitats, irrigation ditches, and rice fields where there is a prey base of small fish and amphibians. Requires grassy banks and emergent vegetation for basking, and areas of high ground protected from winter flooding. | Unlikely. Potential habitat in project area, but extensive surveys for the species in areas around the project area have not been successful. | Yes |

| BIRDS | | | | | |
|--|--|--|---|--|-------------------|
| Species | Status (State/ Federal/ Other*) | Distribution | Habitat | Likelihood of occurrence in project area | Evaluated in EIR? |
| <i>Accipiter cooperi</i> Cooper's hawk | SC/ | Occurs throughout CA except in high altitudes. Winters in Central Valley. | Nests in riparian woodlands, gray pine-oak woodlands, mixed conifer forests. | Present. Observed using project site, and known to nest nearby. | Yes |
| <i>Accipiter striatus</i> Sharp-shinned hawk | SC/ | Throughout CA except in highest altitudes. Only winters in the Central Valley. | Forages in woodland openings, brushy pastures, shorelines where bird prey are found. | Possible. Not observed using project site, but it is likely that they do. Known to nest nearby. | No |
| <i>Agelaius tricolor</i> Tricolored blackbird | SC/ | Permanent resident in Central Valley from Butte to Kern county. | Colonial nester near fresh water, in emergent wetland plants but also thickets of willow, blackberry, and wild rose. Feeds in grassland and cropland habitats. | Present. Use project site for foraging; not known to nest on site. | Yes |
| <i>Ardea herodias</i> Great blue heron | SC/ | Common throughout lower elevations of California. | Shallow estuaries, fresh and saline wetlands, ponds and other slow moving waterways. Nests in colonies in large snags or trees. | Present. Forage and roost on project site. No known nesting, although appropriate trees exist on site. Project not expected to negatively impact foraging. | No |
| <i>Asio flammeus</i> Short-eared owl | SC/ | Resident in isolated populations throughout lower elevations of CA. Widespread winter migrant primarily in Central Valley. | Usually found in open areas with few trees such as grasslands, prairies, dunes, meadows, irrigated lands, and wetlands. Needs dense tules or tall grass for nesting. | Present. Observed intermittently during winter; not known to nest in project area, and unlikely that they do despite on site habitat. | No |
| <i>Athene cunicularia</i> Burrowing owl | SC/BCC | Lowlands throughout CA, including Central Valley. | Level, open, dry, heavily grazed or low stature grassland or desert vegetation with available rodent burrows. | Present. Have been observed on project site, though not during 2005 surveys. Appropriate habitat with ground squirrel burrows is present on project site. | Yes |
| <i>Buteo regalis</i> Ferruginous hawk | SC/BCC | Does not nest in CA; winters in CA at lower elevations and open grasslands in the Central Valley and Coast Ranges. | Open grasslands, scrub, low foothills surrounding valleys. | Low. Primary concern for the species is loss of nesting sites, but the species does not nest in California. | No |
| <i>Buteo swainsoni</i> Swainson's hawk | T/BCC | Once found throughout lowland CA, now restricted to portions of the Central Valley and Great Basin regions. | Agricultural areas, (particularly alfalfa fields), juniper-sage flats, riparian areas, and oak savannas. | Present. Nest and forage on and near project site. | Yes |
| <i>Casmerodius albus</i> Great egret | SC/ | Resident throughout CA except for high mountains and deserts. | Fresh and saline emergent wetlands; along the margins of estuaries, lakes, slow moving streams and ditches; and in irrigated croplands and pastures. Nests and roosts in large trees. | Present. Forage and roost on project site. No known nesting, although appropriate trees exist on site. Project not expected to negatively impact foraging. | No |

| Species | Status (State/ Federal/ Other*) | Distribution | Habitat | Likelihood of occurrence in project area | Evaluated in EIR? |
|--|--|--|--|--|-------------------|
| <i>Charadrius montanus</i> Mountain plover | SC/ | Does not nest in CA. Winters in Central Valley south of Yuba County and along the central and southern coast. | Occupies open plains or rolling hills with short grasses or sparse vegetation, including agricultural fields. | Low. Not observed at project site, although habitat is suitable. Winter usage likely to be minor and intermittent. | No. |
| <i>Circus cyaneus</i> Northern harrier | SC/ | Occurs throughout low-land CA. | Grasslands, meadows, marshes, and seasonal wetlands and agricultural lands. | Present. Nest and forage on and near project site. May benefit from the project. | Yes |
| <i>Egretta thula</i> Snowy egret | SC/ | Occurs in the Central Valley, coastal lowlands, NE plateau and Imperial Valley. | Shallow estuaries and fresh and saline wetlands, ponds and slow moving waterways. Nests in colonies in large snags or trees. | Present. Forage and roost on project site. No known nesting, although appropriate trees exist on site. Project not expected to negatively impact foraging. | No |
| <i>Elanus caeruleus</i> White-tailed kite | FPS/ | Resident in low elevation areas west of Sierras throughout CA; rarely found away from agricultural areas. | Forages in open grasslands, meadows, farmlands and emergent wetlands. Nests in dense oak, willow, or other tree stands. | Present. Nest and forage on and near project site. | Yes |
| <i>Eremophila alpestris actia</i> California horned lark | SC/ | Found throughout California | Occupies a variety of open habitats, usually where large trees and shrubs are absent. | Present. Observed on site in winter but not in summer. Not known to nest on site, though there is appropriate habitat and the species nests nearby. | Yes |
| <i>Falco peregrinus anatum</i> American peregrine falcon | E/BCC, (delisted) | Found throughout California. Permanent resident of Coast Ranges. Winters in the Central Valley. | Nests and roosts on protected ledges in high cliffs, usually adjacent to water bodies. | Present. Known to forage on site during the winter; unlikely to nest on or near project site. May benefit from project. | No |
| <i>Geothlypis trichas sinuosa</i> Saltmarsh common yellowthroat | SC/BCC | Found only in SF Bay Area. | Freshwater marshes in summer and salt or brackish marshes in fall and winter; requires tall grasses, tules, and willow thickets for nesting and cover. | Unlikely. Yellowthroats occur on site throughout the year, but are unlikely to be the subspecies of concern, which is not known from Contra Costa County. | No |
| <i>Grus canadensis tabida</i> Greater sandhill crane | T, FPS/ | In CA, breeds in NE CA, winters in Central Valley. | Winter habitats include annual and perennial grasslands, moist croplands with rice or corn stubble, and open, emergent wetlands. | Possible. Not observed on site in the winter, but known to occur in east Contra Costa County. Does not nest in project area. | No |
| <i>Icteria virens</i> Yellow-breasted chat | SC/ | Throughout North America. Formerly bred throughout CA except in higher mountains and coastal islands. Now, an uncommon summer resident and migrant in coastal CA and in Sierra Nevada foothills. | Uses several habitats, especially riparian thickets and brush. | Present. Species observed and expected to nest on site. | Yes |

| Species | Status (State/ Federal/ Other*) | Distribution | Habitat | Likelihood of occurrence in project area | Evaluated in EIR? |
|---|--|---|--|--|-------------------|
| <i>Lanius ludovicianus</i> Loggerhead shrike | SC/ | Resident and winter visitor in lowlands and foothills of California. | Prefers open habitats with scattered shrubs, trees, fences, posts, utility lines, or other perches. | Present. Occur on project site in winter and summer, and nest on site. | Yes |
| <i>Larus californicus</i> California gull | SC/ | Western US and Canada. In CA primarily in winter where it frequents coastal areas and interior lowlands. | Inland, frequents lacustrine, riverine, and cropland habitats, landfill dumps, and open lawns in cities. Often abundant in CA in winter. | Possible. Not observed on site, but likely to forage there at times. Does not nest in project area. May benefit from project. | No |
| <i>Laterallus jamaicensis californicus</i> California black rail | T, FPS/ BCC | Permanent resident in the SF Bay/Delta region and in isolated areas of the Sierra foothills and S CA. Winter resident in central and southern coastal areas. | Fresh, brackish or tidal marshes with emergent vegetation. | Possible. Has been observed or heard on site. | Yes |
| <i>Melospiza melodia maxillaries</i> Suisun song sparrow | SC/BCC | Restricted to western edge of Delta between the cities of Vallejo and Pittsburg near Suisun Bay. | Brackish and tidal marshes with tall emergent plants. | Unlikely. Song sparrows occur on site throughout the year, but are unlikely to be the subspecies of concern. Not known to occur in project area. | No |
| <i>Numenius americanus</i> Long-billed curlew | SC/BCC (breeding) | Nests in NE CA. Winters along the coast and interior valleys west of the Sierras. | In winter frequents coastal beaches and mudflats and interior grasslands and ag fields. | Known to forage on site in winter. Does not nest in project area. | No |
| <i>Pandion haliaetus</i> Osprey | SC/ | Worldwide distribution. In CA, breeds near lakes from Cascades to Lake Tahoe and along the coast S to Marin County. Winters along coast and slightly inland south from Sonoma County. | Associated strictly with large, fish-bearing waters, primarily in mixed conifer habitats. | Possible. Observed flying over and perched on site, but not known to forage or nest on or near the project site. | No |
| <i>Pelecanus erythrorhynchos</i> American white pelican | SC/ | Present in much of W and Central N America. Throughout SF Bay Area and Delta after breeding. | Coastal areas, large lakes and other water bodies. | Possible. Are known to fly over the project site, but no current use due to limited open water habitat. | No |
| <i>Phalacrocorax auritus</i> Double-crested cormorant | SC/ | Coastal areas of North America, and inland breeding. In Ca, primarily coastal areas, NE part of state, and Central Valley. | Inland lakes, in fresh, salt, and estuarine waters. | Present. Roost in large riparian trees and snags on site, and forage in adjacent sloughs. No known nesting on project site. | No |
| <i>Plegadis chihi</i> White-faced ibis | SC/ | Uncommon summer resident in sections of S CA, rare visitor in the Central Valley, and more common and widespread during winter migration. | Prefers freshwater marshes with emergent vegetation. Commonly forages in winter in flooded ag fields such as rice. | Possible. Have been observed on site. Primary concern is loss of nesting sites, but it is not known to nest in or near project site. | No |
| <i>Rallus longirostris obsoletus</i> CA clapper rail | E, FPS/E | Salt and brackish marshes of SF Bay to Suisun. | Restricted to salt marshes and tidal sloughs. | Unlikely. No habitat at or near project site. | No |

| Species | Status (State/ Federal/ Other*) | Distribution | Habitat | Likelihood of occurrence in project area | Evaluated in EIR? |
|--|--|--|---|---|-------------------|
| <i>Riparia riparia</i> Bank swallow | T/ | Primarily occurs along Sacramento River from Tehama Co. to Sacramento Co., Feather and lower American rivers. | Nests in bluffs or banks, usually adjacent to water, where the soil is sand or sandy loam. | Low. Not observed on site, but may use it in transit between nesting and wintering areas. No nesting habitat on or near site. | No |
| <i>Sterna antillarum browni</i> California least tern | E, FPS/E | Nests on beaches along SF Bay and along S CA coast. | Nests on beaches, mudflats; forages on adjacent surf line, estuaries, or the open ocean. | Low. Do not occur in area in significant numbers; not observed on site. May benefit from project. | No |
| <i>Sterna caspia</i> Caspian tern | /BCC | Breeds in scattered locations across North America, and winters along the Pacific Coast from southern California southward to Guatemala, and along the Atlantic and Gulf coasts. | Breeds in wide variety of habitats along water. During migration and winter found along coastlines, large rivers and lakes. Roosts on islands and isolated spits. | Low. Observed flying over site, but not using open water. Do not nest in project area. May benefit from project. | No |
| MAMMALS | | | | | |
| <i>Antrozous pallidus</i> Pallid bat | SC/ | Arid and semi-arid regions throughout N Mexico and the W US. Occurs throughout CA except in Sierras and the NW part of the state, most abundantly in deserts. | Most common in open, dry habitats with rocky areas for roosting. Roost in rock crevices, trees, buildings, and bridges in arid regions. | Possible. CNDDDB has records of the species near Antioch, there is potential habitat for the species at the project site. | Yes |
| <i>Corynorhinus townsendii townsendii</i> Townsend's western big-eared bat, | SC/ | Common in W US. Throughout CA in numerous habitats except subalpine and alpine areas. | Most abundant in moist habitats. Roosts primarily in mines and caves, but also in buildings and other human structures. | Possible. East Contra Costa HCP reports no published records of the species in Contra Costa County. | Yes |
| <i>Lasiurus blossevillei</i> Western red bat | SC/ | Locally common from Shasta County to Mexican border, west of Sierra crest and deserts. Winter range includes western lowlands and coastal regions south of SF Bay. | Roosts in trees or shrubs in forests and woodlands from sea level up through mixed conifer forests. Common in riparian areas. Feeds over grasslands, shrublands, open woodlands and forests, and croplands. | Possible. Known to occur in general area. (CNDDDB records from Brannan Island and Antioch). | Yes |
| <i>Lasiurus cinereus</i> Hoary bat | SC/ | Throughout North America. In CA, throughout the state. | May be found in any location in CA. Roosts in trees | Possible. Known to occur in general area. (CNDDDB records from Brannan Island). | Yes |
| <i>Reithrodontomys raviventris</i> salt marsh harvest mouse | E, FPS/E | Marshes around San Francisco, San Pablo, and Suisun bays. | Saline and brackish marshes with thick cover of halophytic plants with layered structure. | None. No suitable habitat. | No |
| <i>Vulpes macrotis mutica</i> San Joaquin kit fox | T/E | Mainly in San Joaquin Valley, but also in interior valleys, plus areas of Contra Costa County | Favors grasslands and scrub habitats with fine textured soils. | Unlikely. Little suitable habitat in the project area. | No |

*E=Endangered under state or federal Endangered Species Act

T=Threatened under state or federal Endangered Species Act

SC=California Special Concern species

FPS=California Fully Protected Species

BCC=USFWS Bird of Conservation Concern

CNPS = California Native Plant Society rare plant lists

- 1A. Presumed extinct in California
- 1B. Rare or endangered in California and elsewhere
2. Rare or endangered in California, more common elsewhere
3. More information needed
4. Plants of limited distribution

SPECIAL-STATUS PLANT SPECIES. A large number of special-status plant species have some potential to occur on the project site, in areas that may be affected by the project alternatives, or in the project vicinity. Only a small number of special-status plant species, however, are likely to occur, and only one sensitive species was found in botanical surveys conducted by DWR in 2004. The sensitive plant species listed in Table 3.4.1 are based on regional lists, the CNDDDB, USFWS lists, and databases based on U.S. Geological Survey quadrangles. The results of database searches and field surveys performed for similar, adjacent parcels of the East Cypress Corridor project sites (Leshner, Biggs, Dal Porto parcels) and Big Break Regional Shoreline were considered in evaluating sensitive species and likelihood of occurrence.

Plant surveys of the areas inside project site levees, along Marsh Creek bordering the project site, and along all the exterior levees were performed by DWR staff in 2004 (DWR 2004a). These surveys occurred throughout the spring and summer and specifically targeted several sensitive plant species. Targeted rare plant species were based on a CNDDDB search of the Jersey Island and Brentwood USGS quads. (The lists generated for this EIR included Jersey Island and Brentwood, plus the two adjacent quads, Bouldin Island and Woodward Island.) Many special-status plant species require focused surveys by expert botanists (following survey guidelines for rare plants by California Department of Fish and Game or the California Native Plant Society) for detection. This DEIR considers all available information, including DWR plant surveys, wetland delineations, and botanical surveys of neighboring sites with similar soils, topography, and vegetation, to assess the likelihood of occurrence for special-status plant species.

Criteria for recognizing the special status of plants are varied. Plants listed as threatened or endangered under State and Federal Endangered Species Acts have the strongest legal protection, and are often, but not always, the rarest or most at risk of extinction. The California Native Diversity Database ranks plant species according to legal protected status as well as other classes of rarity or threat. The California Native Plant Society (CNPS) maintains a scientifically peer-reviewed and updated list (Inventory) of plants with various ranks for rarity or threat, as well as provisional “watch” status for species about which limited information is available about current distribution and abundance. CNPS also has published a broader set of conservation criteria including limits of species’ ranges, regional rarity, isolated remote populations, or other biogeographic considerations for native plants of Alameda and Contra Costa County (Lake 2004). The U.S. Fish and Wildlife Service also treats

plant “species of concern” in recovery plans – species at foreseeable risk of decline or future threat – as the focus of conservation planning efforts. Only federal and state-listed species have special legal protected status, but EIRs may evaluate the special status any species with a “fair argument” (valid scientific or conservation policy reason) for significant impacts.

Special-status plant species that are known to occur, or have an appreciable risk of occurring on the project site, or are likely to be otherwise affected substantially by project alternatives, are discussed in detail below.

ALKALI MILK-VETCH, *ASTRAGALUS TENER* VAR. *TENER*. (CNPS list 1B)

Alkali milkvetch is a low-growing annual herb in the pea family, related to desert locoweeds. It occurs rarely in alkaline to subsaline seasonal wetlands (alkaline vernal pools and flats, playa, and similar habitats with sparse cover and seasonally flooded and dry flats). Suitable artificial habitat occurs on the project site (alkali meadow, seasonal pond edges), but the species has been presumed extirpated in Contra Costa County. It has, however, been rediscovered at other localities within its historic range after being presumed extirpated, and in former agricultural lands that reverted to alkali-subsaline seasonal wetlands after farming was ceased. As an annual seasonal wetland species, it may necessarily emerge in unfavorable years (hydrology, competition may inhibit it), or it may emerge and reproduce erratically and intermittently. It may persist as long-dormant soil seed banks, or it may be dispersed long distances very rarely. Because the 2004 surveys did not target this plant, and because the plants in the alkali habitats are likely to differ from year to year, more intensive, surveys would be required for detection.

SAN JOAQUIN SALT BUSH, *ATRIPLEX JOACHINIANA* (CNPS list 1B), and other rare *Atriplex* species: Crownscale, *Atriplex coronata* var. *coronata* (CNPS list 4); Brittlescale, *Atriplex depressa* (CNPS list 1B); and Heartscale, *Atriplex cordulata* (CNPS list 1B).

A suite of annual, low, spreading forbs in the amaranth family (traditionally chenopod or goosefoot family) in the genus *Atriplex* are native to alkaline to subsaline seasonal wetland habitats (alkali meadow or grassland, alkali scrub, playa, vernal pools), and occur in the Sacramento-San Joaquin Valley. They may occur in suitable subsaline to alkaline artificial seasonal wetland habitats at the project site, but none have been detected in general plant surveys. Many *Atriplex* species are structurally similar in aspect, and resemble common, abundant species such as sparscale, *A. triangularis* (syn. *A. prostrata*), which may obscure detection of rarer species. They generally have light buoyant fruits with small seeds that can be dispersed by water or waterfowl, and may spontaneously colonize unoccupied habitats. One of these uncommon to rare species, crown scale (*A. coronata* var. *coronata*) was unexpectedly discovered in small patches of alkali meadow at the nearby Dal Porto South parcel during focused surveys in 2004, in habitat substantially similar to seasonal wetlands that occur at the Dutch Slough project site. This indicates that alkali meadow and alkaline-subsaline seasonal wetlands supporting *Atriplex* species at Dutch Slough parcels are likely suitable habitat for crownscale and related native rare *Atriplex* species. It also suggests that there is a small chance that crownscale and other special-status *Atriplex* species could establish in Dutch Slough alkali meadow/seasonal wetland patches, or may occur there now undetected.

BIG TARWEED, *BLEPHARIZONIA PLUMOSA* VAR. *PLUMOSA*. (CNPS List 1B).

Big tarweed is a glandular, strongly scented coarse gray-green annual forb of arid grasslands. It occurs in the northwestern San Joaquin Valley, including portions of Contra Costa County. It

could potentially occur on the project site, and may be difficult to detect in surveys because of abundant yellow-flowered, summer-blooming annual aster family species. It was not observed on the site in general plant surveys in 2004 (DWR 2004a). No populations are known from the project vicinity, and it is considered unlikely to occur.

MASON'S LILAEOPSIS, *LILAEOPSIS MASONII*. (CNPS List 1B).

Mason's lilaeopsis is a highly inconspicuous, creeping forb in the carrot family. This rare species occurs mostly in low, turfy, sparsely vegetated, or otherwise bare tidal marsh substrates of eroding marsh banks, but it also sometimes colonizes patches of mud on rock slope protection. It is geographically restricted to northern San Pablo Bay east through the Delta. The status of Mason's lilaeopsis in the tidal marsh banks bordering Dutch Slough, Little Dutch Slough, and Emerson Slough is uncertain because no survey information is available. . Some potentially suitable habitat likely exists along the outer edges of fringing tidal marsh bordering the project site. The water-side levees around the Dutch Slough parcels were surveyed from the water during 2004, and Mason's lilaeopsis was not found. Further surveys will be conducted prior to any water-side levee disturbance.

DELTA MUDWORT, *LIMOSELLA SUBULATA*. (CNPS List 2). Delta mudwort is a tiny and highly inconspicuous annual plant. It occurs in wet mud or sand banks and flats within freshwater tidal marshes of the Delta. It also occurs in Europe, but California populations are presumed to be native. Potential habitat for Delta mudwort may occur along the fringing tidal marsh banks of Emerson Slough, Little Dutch Slough, and Dutch Slough. The water-side levees around the Dutch Slough parcels were surveyed from the water during 2004, and Delta mudwort was not found. Further surveys will be conducted prior to any water-side levee disturbance.

SUISUN ASTER, *SYMPHYOTRICHUM LENTUM* (syn. *Aster lentus*, CNPS List 1B)

Suisun aster is a tall, erect, perennial forb with creeping below-ground stems that forms colonies near the upper edges of brackish or alkaline perennial marshes, particularly tidal marshes of the Suisun Marsh area and the western Delta. Suisun aster closely resembles, and sometimes intergrades with, the more common aster, *Aster chilense*. It also can establish in non-tidal freshwater or slightly brackish, alkaline marshes. Local populations often occur as multiple clonal colonies near each other. Isolated colonies composed of single clones (genetic individuals) are unlikely to reproduce successfully by seed.

DWR detected nine colonies of Suisun aster along the fringing tidal marshes of the outer levees of Emerson Slough and Marsh Creek, bordering the Emerson Parcel (DWR 2004a). No colonies of this species were detected in non-tidal freshwater marshes on the site. Essentially similar suitable habitat occurs along the fringing marshes of other parcels of the Dutch Slough project site as well. Ditch edges and some non-tidal freshwater marshes could potentially support Suisun aster, but environmental factors severely restrict the likelihood of viable perennial populations there (frequent disturbances from ditch maintenance, extreme fluctuation in water levels of freshwater non-tidal marshes, and high competition from tules, willows, and blackberry along narrow, steep marsh edges).

The Marsh Creek populations of Suisun aster along the western Emerson Parcel levee may have been disturbed or extirpated along reaches of Marsh Creek that were subjected to channel maintenance (vegetation clearing, dredging for flood conveyance) in 2005. A few additional populations of Suisun aster are known to occur in the project vicinity (Antioch Dunes National Wildlife

Refuge shoreline, Big Break, to Sand Mound Slough. Natural long-distance dispersal of Suisun aster and successful colonization is probably very infrequent. Suisun aster and other perennial asters with creeping below-ground stems are easily propagated by seed or vegetative clonal division. The likelihood of artificially establishing propagated populations in natural or restored marshes, however, is uncertain. Established perennial colonies are likely to persist for long periods of time unless disturbed.

SPECIAL-STATUS WILDLIFE SPECIES. A number of special-status wildlife species have some potential to occur on the project site or within the project vicinity, in areas that may be affected by the project alternatives. Only a small number of special-status wildlife species, however, are likely to occur in existing Project-site habitats. The assessment of wildlife species impacts is based primarily on the following sources of information: (1) on-site general bird surveys by DWR staff biologists (DWR 2005b), and Natural Heritage Institute (NHI 2004); (2) reports and surveys of special-status wildlife species at Marsh Creek, Contra Costa Canal, and adjacent ranches with similar habitats (Arnold 2005, Dexter 2005, Sycamore Associates 2004, 2005; Swaim 2004, 2005).

Criteria for recognizing the special status of wildlife species are varied. Species listed as threatened or endangered under State and Federal Endangered Species Acts, or the California Fish and Game Code (fully protected species section) have the strongest legal protection, and are often, but not always, the rarest or most at risk of extinction. The California Natural Diversity Database ranks wildlife species according to legal protected status as well as other classes of rarity or threat.

SPECIAL-STATUS BAT SPECIES.

The abandoned agricultural buildings on the site, particularly at the Emerson parcel, provide potential roosting and nursery habitat for some special-status (species of concern or special concern) bat species, such as western red bat (*Lasiurus blossevillei*) and hoary bat (*Lasiurus cinereus*). Other possible species, though less likely to occur because of their range or habitat needs are Townsend's western big-eared bat (*Corynorhinus townsendii townsendii*), western mastiff bat (*Eumops perotis californicus*), small-footed myotis (*Myotis ciliolabrum*), long-legged myotis (*Myotis volans*), and Yuma myotis (*Myotis yumanensis*). Bats are site-faithful, and are likely to return to successful breeding or roosting sites, which aids in their detection. The adjacent open pastures and ruderal lands interspersed with wetlands provide ample potential foraging habitat for bats. Large old trees and snags (dead standing trees) associated with windbreak and ornamental plantings of the historic ranches may also provide cavity habitat suitable for bats. Bats are likely to occur in some or most of the suitable habitats provided by old trees and abandoned buildings on site. Neither an inventory of bat habitat nor surveys for populations have been done to determine their presence or absence.

PALLID BAT, *ANTROZOUS PALLIDUS*. (California species of special concern)

The pallid bat occupies a wide variety of habitats including grasslands, shrublands, woodlands, and forests from sea level up through mixed conifer forests. It is most common in open, dry habitats with rocky areas for roosting. It is a yearlong resident in most areas of California. Pallid bats feed on a wide variety of insects and arachnids, taking them primarily from foliage or off the ground.

Daytime roosts are in caves, crevices, mines, and occasionally in hollow trees or buildings. Few hibernation sites are known, but the species probably uses rock crevices. Maternity colonies

form in early April and commonly have fewer than 100 individuals. Mating occurs from October to February with delayed fertilization, and young are born from April through July.

The species is very sensitive to disturbance of roost sites, which are essential for metabolic economy, juvenile growth, and as night roosts to consume prey.

TOWNSEND'S WESTERN BIG-EARED BAT, *CORYNORHINUS TOWNSENDII TOWNSENDII*. (California species of special concern)

Townsend's western big-eared bats require caves, mines, tunnels, buildings or other human-made structures for roosting. Small moths are the primary food, and they are caught in flight using echolocation, or are gleaned from foliage. Small groups, usually less than 100 individuals, form a maternity roost in relatively warm caves, tunnels, or buildings. The species is relatively sedentary, moving only short distances to hibernation sites. Hibernation occurs from October through April. Mating occurs prior to hibernation, fertilization is delayed, and birth of a single young occurs during May or June.

The species is extremely sensitive to disturbance of roost sites, and abandonment of nursery roosts may have led to its sharp decline in California.

WESTERN RED BAT, *LASIURUS BLOSSEVILLII*. (California species of special concern)

Western red bats typically roost singly in the foliage of broad-leafed trees such as sycamores, cottonwoods, walnuts, and fruit trees. Roosts are shaded from above and on the sides, generally three to many feet off the ground, and open below, thus allowing these bats to drop into flight. They forage on moths, beetles, flying ants, and occasionally on ground-dwelling crickets, and are known to forage near streetlamps. Individuals usually remain within about 1,000 yards of their roosts. Most young are born between mid-May and June. In late fall, western red bats are thought to migrate to and hibernate in the southern part of their range. Threats to the species include loss of riparian forests and use of pesticides in agricultural areas. The CNDDB has recent records from Brannan Island State Park.

HOARY BAT, *LASIURUS CINEREUS*. (California species of special concern)

This bat is migratory and moves northward in spring and southward in winter. Like its relative the red bat, with which it frequently associates, the hoary bat is more or less solitary and frequents wooded areas where it roosts in the open by hanging from a branch or twig. Hoary bats are thought to prefer trees at the edge of clearings, but have been found in trees in heavy forests, open wooded glades, and shade trees along urban streets and in city parks. The chief food is moths, although they are known to also eat beetles, flies, grasshoppers, termites, dragonflies, and wasps. One to four young are born from mid-May into early July. From August through October, hundreds of hoary bats may travel together during fall migration. In the United States, most apparently overwinter in coastal areas, along the West Coast from San Francisco south. The CNDDB has recent records from Brannan Island State Park.

SPECIAL-STATUS BIRDS

SPECIAL-STATUS RAPTORS. Numerous special-status raptor species are known to occur at the project site or in its vicinity, and most may be affected by project construction activities and long-term habitat conversion. Species that are likely to be affected are discussed below.

COOPER'S HAWK, *ACCIPITER COOPERI*. (California species of special concern).

Cooper's hawks occur throughout the US and Mexico, but numbers are declining in most areas. Suitable habitat areas include deciduous, evergreen, and mixed forests; open woodland habitats; and urban and suburban areas. They are usually found in areas with dense tree cover, and near open water. Nests are placed high in trees, and they will nest in close proximity to human activity. Cooper's hawks primarily eat birds, but will also take small mammals.

Breeding begins in March, and most chicks are fledged by July. In California the species is resident, with little migratory or seasonal movements.

Population declines have been attributed to the use of DDT, and habitat loss, mainly loss of low-land riparian areas.

Cooper's hawks have been observed at the project site and are reported to nest nearby. The project site's riparian woodlands, thickets, and tree plantings (windrows, residential ranch ornamental trees) provide suitable nesting habitat.

BURROWING OWL, *ATHENE CUNICULARIA HYPUGEA*. (California species of special concern)

Burrowing owls in California historically ranged throughout the Central Valley, in suitable habitat in coastal areas from Marin County to the Mexican border, and in lower numbers in desert areas of the northeastern and southeastern portions of the state. Throughout the vast majority of the burrowing owl's range in California, breeding owls now persist in only small, declining populations of birds that are highly susceptible to extirpation.

Burrowing owls are found in open, dry grasslands, agricultural and range lands, and desert habitats; they are usually associated with burrowing animals such as ground squirrels. Burrowing owls tend to be opportunistic feeders, with large arthropods, mainly beetles and grasshoppers, comprising a large portion of their diet. The species is primarily crepuscular (active at dusk and dawn), but will hunt throughout a 24-hour period.

Burrowing owls may use a site for breeding, wintering, foraging, and/or migration stopovers. Breeding occurs from March through August, with the peak activity in April and May. In addition to natural and artificial burrows, the owls may use artificial structures such as culverts, piles of concrete, large rock, and man-made and natural woodpiles as refugia.

The species has been reported to occur on the site (though they were not observed during 2005 surveys by DWR wildlife biologists), and they are known to forage and breed in similar habitats in adjacent sites (now under residential development; Sycamore Associates 2004, 2005, 2005d). They have also been observed nesting on the banks of the Contra Costa Canal adjacent and south of the project site (Swaim 2004). Extensive foraging and nesting habitat occurs on the project site, which supports extensive ground squirrel burrows, short grazed vegetation, disturbed ditch banks, and large populations of small mammal and insect prey. Most pasture and ruderal habitat that is not seasonally flooded is likely to provide potential suitable habitat for burrowing owls.

SWAINSON'S HAWK, *BUTEO SWAINSONI*. (federal bird of conservation concern, state listed as threatened).

Swainson's hawks were once found throughout lowland California but today are restricted to portions of the Central Valley and Great Basin regions where suitable nesting and foraging habitat is still available. Suitable foraging areas include native grasslands or lightly grazed pastures, alfalfa and other hay crops, and certain grain and row croplands. Unsuitable foraging habitat includes crops such as vineyards, orchards, certain row crops, rice, corn and cotton crops. Suitable nest sites may be found in mature riparian forest, lone trees or groves of oaks, other trees in agricultural fields, and mature roadside trees. In the summer months, Swainson's hawks primarily eat insects, birds, and small mammals. During migration and in the winter, the hawk's diet consists almost entirely of insects.

Within California, Swainson's hawks begin nesting in late March and the young usually leave the nest (fledge) by July. Nests are constructed in trees, shrubs, or on utility poles at heights of 4 to 100 ft. above the ground. Migratory flocks begin to form in late August and September and most birds are on the wintering grounds in Mexico by November. In the spring, they begin returning north to California in March.

The populations of Swainson's hawks have declined by 90% since the 1940's due to the loss of nesting habitat. In the 1980's there was an estimated 375 pairs within California, but not all pairs nested.

Swainson's hawks have been observed nesting and foraging on the project site in multiple years, and Swainson's hawks have been documented nesting and foraging in the project vicinity (DWR 2004b, Sycamore Associates 2004, 2005; Sycamore Associates 2005c). Suitable habitat with ample prey base for Swainson's hawk occurs at the project site, but has declined substantially in the project vicinity because of land use conversion from agriculture to residential/urban development. A 2005 Analysis of cumulative impacts to habitat availability indicate that recent development adjacent to the project site removed over 2500 acres of suitable habitat, but over 15,000 acres will remain available for the foreseeable future (25 years), assuming stable rates of land use conversion.

WHITE-TAILED KITE, *ELANUS LEUCURUS*. (California fully protected species).

California contains the largest number of white-tailed kites in North America. The species is found in virtually all lowlands of California west of the Sierra Nevada range and the southeast deserts. It is a common resident of the Central Valley and along the entire CA coast. White-tailed kites occur in lowland grasslands, agriculture, wetlands, oak-woodland and savannah habitats, and riparian areas associated with open areas.

Kites feed almost exclusively on mice, and occurrence of kites is tied to prey abundance. Habitats with larger prey populations are more suitable; ungrazed lands support higher prey populations than grazed lands. Summer habitat preferences to include riparian zones, dry pastures, alfalfa, orchards, and rice stubble fields. Plowed fields were avoided in both winter and summer.

Kites nest in shrubs and trees of various species; they will nest in single isolated trees or trees within large stands. Nest-building occurs January through August; peak fledging probably occurs in May and June with most fledging complete by October.

Kites have been observed foraging at the project site, and suitable potential foraging habitat with ample prey base is widespread there (DWR 2004b). Suitable breeding habitat also occurs on site

(small tree groves, windbreak tree plantings, riparian woodland patches), and the species was observed nesting on the site during bird surveys in 2005.

NORTHERN HARRIER, *CIRCUS CYANEUS*. (California species of special concern)

Northern harriers, formerly called marsh hawks, occur in open fields, grasslands, prairies, and marshes from Alaska, northern Canada, and Maritime Provinces south to southern California, Arizona, Kansas and Virginia for breeding. In California, some birds are year-round residents, while others migrate into the state in the winter.

This species breeds primarily in open wetland areas, foraging widely in wet pastures, dry uplands and desert shrub habitat. Densest populations are typically associated with large tracts of undisturbed habitats dominated by thick, low vegetation. Harriers feed on mice, rats, snakes, frogs, and other small animals by sound as well as sight. Adult males migrate later in fall, earlier in spring, than females and immatures.

Breeding occurs April to September. Northern Harriers nest on the ground in open, treeless areas such as marshes, wet meadows, and dry grasslands. Nests are typically placed in patches of dense vegetation such as cattails, usually close to water or on mats of vegetation raised above water level. Harriers are nomadic, and both breeding and nonbreeding densities may vary in response to local changes in prey availability and habitat condition.

Loss of wetland habitat poses an ongoing threat to breeding and wintering populations. Conversion of native grassland to irrigated agriculture has contributed to local population declines, and remains a threat in some areas. Prey availability may be reduced by widespread use of insecticides and rodenticides, as well as by overgrazing of pastures. They have been observed foraging and nesting on the project site, and are likely to forage also over adjacent tidal marshlands at Big Break (DWR 2004b).

SPECIAL-STATUS PERCHING BIRDS

TRICOLOR BLACKBIRD, *AGELAIUS TRICOLOR*. (California species of special concern).

The tricolored blackbird is a California endemic. Most breeding occurs in California's Central Valley from April through July. A large portion of the population is believed to overwinter in the Sacramento - San Joaquin Delta.

Tricolored blackbirds are colonial nesters. Traditional nesting habitat consists of inundated dense cattail or tule marshes, but nesting also occurs in upland habitats such as agricultural grain fields, thickets of blackberry, or patches of thistle or stinging nettle. Foraging mostly occurs in upland habitats, especially in dry grassland and pastures; heavily grazed fields are usually not suitable foraging habitat. Winter roosting habitat consists mostly of dense deepwater marshes and nearby trees.

During the nonbreeding season, tricolored blackbirds forage on insects, grains and seeds. When provisioning offspring, however, adults forage almost entirely on insects, so breeding habitat selection is most likely primarily a function of insect densities. Colonies, therefore, may occur regularly in some locations but sporadically in others. Breeding tends to be highly synchronized within colonies where active nest densities may reach 3 or more per square meter. Colonies range in size from less than one hundred to tens of thousands of breeding adults.

Because tricolored blackbirds are colonial, they require concentrated food resources within a manageable commuting distance from the colony. The size of the foraging arena, therefore, varies with colony size and insect abundance. Foraging arenas of successful colonies may range in size from a radius of 2-3 miles to as many as 8 miles.

Declines in numbers of tricolored blackbirds are primarily due to loss of both breeding and foraging habitat.

Extensive suitable foraging and breeding habitat for tricolor blackbirds occurs in the complexes of irrigated dairy pasture and interspersed seasonal wetlands with nontidal freshwater marsh at the project site. Tricolor blackbirds are highly colonial, and tend to occur in large numbers in occupied habitat. During bird surveys in 2005, the species was intermittently abundant on the site in the winter, but there was no breeding.

CALIFORNIA HORNED LARK, *EREMOPHILA ALPESTRIS ACTIA*. (California species of special concern)

The California horned lark is a yearlong resident in California and can be found in a variety of open habitats, from grasslands on the coast to alpine dwarf-shrub habitat above treeline. They occur in short-grass prairie, bald hills, mountain meadows, open coastal plains, fallow grain fields, and alkali flats. The species forages primarily on insects and other invertebrates during breeding, and adds seeds and other plant matter to its diet in other seasons.

Breeding occurs from March through July, with peak activity in May. Nests are built on the ground in the open. Territories are maintained only during the breeding season, after which large flocks forage and roost together.

Continuing threats to the species include habitat destruction and fragmentation. Pesticides have been shown to poison and kill horned larks, and nests are lost to mowing, plowing and other agricultural practices.

Horned larks have been observed on site in winter but were not observed there in summer (DWR 2004b). They are known to nest in the project vicinity, but no nests are known to occur at the project site, which does support suitable nesting and foraging habitat.

LOGGERHEAD SHRIKE, *LANIUS LUDOVICIANUS* (California species of special concern)

A common resident and winter visitor in lowlands and foothills throughout California. Prefers open habitats, including agricultural areas, with scattered shrubs, trees, posts, utility lines or other perches from which to search for prey. Feeds primarily on large insects, but also takes small vertebrates.

Lays eggs from March into May; young become independent in July or August. Well-concealed nests are built in dense shrubs or trees.

Throughout its range in North America, populations are declining due to loss of habitat. However, numbers in California are fairly stable.

Loggerhead shrikes forage on areas of the project site where abundant, productive terrestrial foraging habitat (ruderal, pasture, riparian woodland) exists. They also nest on site. No estimates of

local loggerhead shrike population size are available, but relatively few have been observed (DWR 2004b).

YELLOW-BREASTED CHAT, *ICTERIA VIRENS*. (California species of special concern)

The yellow-breasted chat is a summer resident and migrant of the northwestern state, coastal areas, scattered desert areas, and in the foothills of the Sierra Nevada. In California, chats require dense riparian thickets of willows, vine tangles, and dense brush associated with streams, swampy ground and the borders of small ponds (Small 1994). Some taller trees (i.e., cottonwoods and alders) are required for song perches. Chats feed on both berries and insects. They arrive in California between March and May. Breeding occurs from early May into early August, and they depart the breeding grounds in August and September; some stragglers remain into October. Occurrence of the species is poorly documented due to the species' secretive nature; it goes largely undetected once singing ceases in mid-July.

Yellow-breasted chat (a large warbler) is known to occur in riparian habitats on the project site (DWR 2004b).

CALIFORNIA BLACK RAIL, *LATERALLUS JAMAICENSIS COTURNICULUS*. (listed as threatened and fully protected species).

California black rails are year-round residents in the Bay-Delta region, and generally inhabit brackish to freshwater tidal marshes with ample high marsh that remains emergent most of the monthly spring-neap tidal cycle, and has ample high tide cover near tidal channel banks. Tidal channels usually correspond closely with patterns of territory and nesting. Occupied marshes are those with vegetation that provides dense cover from predators, but are fairly open at ground level to provide rails opportunities for foraging and nesting. They forage primarily on invertebrates (insects, mollusks, amphipods) and some seeds.

Breeding occurs from February through July. Nest location is determined by the size of the wetland, cover density, wetland plant species composition, water levels and food availability. The nest is concealed in dense vegetation at ground level or a few inches above.

California black rails are reported to occur in fringing tidal marshes adjacent to the project site, and they are known to occur in tidal marshes in the project vicinity. No black rails were detected on the project site by DWR biologists during surveys (DWR 2004b), but they have previously been reported from tidal marshes in the project vicinity (NHI 2004). Virginia rails and sora, which inhabit similar habitats, have been reported previously from the Emerson and Burroughs parcels (Sycamore Associates 1999). Black rail populations near the site are of critical importance as founder source populations for colonizing restored habitat of the project.

SPECIAL-STATUS AMPHIBIANS

CALIFORNIA TIGER SALAMANDER, *AMBYSTOMA CALIFORNIENSE*. (federally listed as threatened; California species of special concern)

California tiger salamanders are rare amphibians of grasslands and oak savannahs, with patchy geographic distribution from Sonoma County to the Central Valley, and south to Santa Barbara. They inhabit shallow seasonal ponds or pools (including alkali meadows, playa, and vernal pools) during larval stages and breeding periods, and move to mammal burrows in grasslands during the dry season. Their population viability depends on ponds of sufficient duration for breeding and

larval development, but with summer desiccation to restrict predatory fish and bullfrogs. They are probably excluded from freshwater marshes with stable local predator populations. Long-distance dispersal across non-habitat is probably exceedingly rare. Most extant populations are probably fragmented remnants of former widespread local populations.

The nearest known population to the project site occurs at the Sand Creek and Cowell Ranch State Park areas, miles from the project site, and separated by urban barriers to dispersal. It is unknown whether old, relict populations occur within seasonal wetland complexes (alkali meadow, seasonal pools, flats) on the site, independent of (unlikely) dispersal from offsite populations. Similar seasonal wetland pools and alkali meadows occurred on similar irrigated pastures of neighboring ranches, where periods of inundation ranged up to 120 days (Dexter 2005), probably sufficient for California tiger salamander breeding. Burrows of ground squirrels are also abundant in the vicinity of seasonal wetland pools on the project site. No California tiger salamanders have been detected in general amphibian surveys of neighboring ranches with similar habitat, but no focused surveys were conducted on the Dutch Slough Restoration Project site or the related project sites.

CALIFORNIA RED-LEGGED FROG, *RANA AURORA DRAYTONII*. (federally listed as threatened, California species of special concern)

The California red-legged frog is a federally listed threatened amphibian species (species of concern for California). It typically inhabits shallow ponds, emergent freshwater marsh, and fresh-brackish marsh with water throughout summer most years. It also may occur in relatively still marshy channel pools in streams, and has adapted to artificial ponds (stock ponds, ditches). One of the principal threats and constraints on habitat suitability for this species is intensive predation by bullfrogs). Otherwise suitable marsh habitats of California red-legged frogs may be rendered unsuitable when substantial populations of bullfrogs establish. California red-legged frog populations may remain viable in marshes isolated from bullfrog populations, or in marshes with environmental fluctuations (hydroperiods, salinity) that are tolerated by red-legged frog adults, but not bullfrog adults or tadpoles.

The closest reported occurrences of the red-legged frog are upstream in Marsh Creek, approximately seven miles south of the project; there are no CNDDDB occurrences for the closer reaches of Marsh Creek.

California red-legged frogs have not been detected in either nontidal or tidal freshwater marshes at Dutch Slough parcels. The irrigation ditches of Dutch Slough parcels support very large bullfrog populations, and these are a possible cause of local extinction of red-legged frog populations that could otherwise occur in suitable habitat. There are some freshwater marshes with seasonal water fluctuations (September-October drawdown, emergence) and moderately low salinities (several parts per thousand salinity/alkalinity) that could potentially act as refuges from large bullfrog populations. General wildlife surveys by DWR staff biologists failed to detect California red-legged frogs (T. Hall. DWR, pers. comm. 2005.) No California red-legged frog populations were detected in adjacent ranchland parcels (Leshner, Biggs, Dal Porto South) with essentially similar habitat during recent intensive reptile surveys (Swaim 2005). No California red-legged frogs are known to occur within likely dispersal distances through suitable habitat corridors; the nearest known source population is at Cowell Ranch State Park (Marsh Creek watershed), over seven miles upstream, across abundant bullfrog (predator) habitat. Most potential freshwater marsh habitat connectivity among parcels also occurs through ditches that support highly abun-

dant bullfrogs, and are likely predation “sinks”. Thus, there is a very low probability of California red-legged frog occurrence or natural dispersal to the project site, where existing bullfrog-dominated habitats select against them. Some potentially suitable isolated seasonally emergent freshwater marsh, however, does exist at the project site, particularly where evidence of western pond turtle breeding occurs.

SPECIAL-STATUS REPTILES

Several special-status reptile species may potentially occur on the project site, but only one is known to occur on site (northwest pond turtle). The risk of undetected giant garter snake occurrence in suitable habitats on site is considered sufficient to warrant evaluation of project impact to this species.

SILVERY LEGLESS LIZARD, *ANNIELLA PULCHRA PULCHRA*. (California species of special concern)

The silvery legless lizard is found from Antioch south to Baja California. This fossorial reptile constructs burrows in sandy or loose soils. Its distribution is restricted to areas with undisturbed sandy or loose loamy soils, particularly under sparse vegetation of beaches, dunes, chaparral, or pine-oak woodlands; or near sycamores, cottonwoods, or oaks on stream terraces. Sandy loam soils on stabilized dunes seem to be especially favorable habitat.

The species is insectivorous, feeding largely on larval moths and beetles, adult beetles, termites, and spiders. Breeding occurs between early spring and July. One to four live young are born between September and November. Sexual maturity is reached in 2 or 3 years.

The silvery legless lizard is in decline primarily due to habitat loss and disturbance of the loose soils that are necessary for its survival.

The subspecies is known to occur near the project area. There are several CNDDB occurrences from Contra Costa County, and an East Bay Regional Park District Legless Lizard Preserve is located about 1 mile west of the SW corner of the Dutch Slough Project boundary.

NORTHWESTERN POND TURTLE, *EMYS MARMORATA MARMORATA*. (California species of special concern).

The northwestern pond turtle (northern subspecies of western pond turtle; Stebbins 2003) inhabits permanent fresh to brackish ponds, sloughs, and streams with still or slow-flowing channel pools, where marsh or riparian woodland vegetation cover and basking sites (large woody debris, mud or bedrock outcrop banks) are present. Nesting sites are in terrestrial or seasonal wetland grasslands or similar terrestrial vegetation up to 400 meters from aquatic habitats. Individual turtles may be long-lived (decades).

Northwestern pond turtles have been detected in freshwater nontidal marshes within the project site, in Marsh Creek, and in the Contra Costa Canal. Although focused surveys for WPT were not conducted on the project site, several of various sizes were observed during habitat evaluations in 2005. Western pond turtles were observed basking on the banks, as well as on debris, and mats of downed vegetation in ditches and ponds. Perhaps the greatest densities of pond turtles were seen in the large east-west irrigation ditch on the Burroughs parcel and in the disposal ponds on the Gilbert parcel. The only observation of a WPT on the Emerson parcel was a juvenile which was found in one of the overgrown irrigation ditches with just a small puddle of water

present. One of the Stage 1 Expectations for western pond turtles in the CALFED Ecosystem Restoration Program Plan is that “populations of turtles that appear to still have successful reproduction will have been located and protected, in conjunction with other habitat protection measures” (CALFED, 2000). This sighting confirms that successful reproduction is occurring on the project site, and protection or enhancement of nesting areas and microhabitats for hatchlings and small juveniles should be priorities for this project.

GIANT GARTER SNAKE, *THAMNOPHIS GIGAS*. (federal and state-listed as threatened)

While giant garter snakes historically inhabited natural wetlands of the Central Valley, they now occupy a variety of agricultural, managed, and natural wetlands, as well as uplands adjacent to these areas. Giant garter snakes consume predominantly aquatic prey such as fish and amphibians. They are typically active from early spring through late-fall and inactive during the winter during which time they require upland hibernacula in the form of cracks and burrows in areas high enough to provide refuge from winter flood waters.

The following essential habitat components are recognized as necessary to support healthy populations of the species: (1) adequate water during the snake’s active season to maintain dense populations of prey species; (2) emergent, herbaceous wetland vegetation for escape cover and foraging habitat; (3) grassy banks and openings in waterside vegetation for basking; and (4) higher elevation upland habitat for cover and refuge from flood waters during the snake’s inactive season.

Within the project area, the potential habitat consists of irrigation ditches, disposal ponds, and borrow ponds. Water rarely persists in the irrigation ditches, so despite the growth of emergent vegetation such as cattails and bulrushes, the ditches are not ideal habitat. However, some toe drains and larger, deeper ditches appear to possess water throughout the active season. In addition to the irrigation ditches, there are ponds in the Gilbert parcel which remain wet throughout the active season and support emergent vegetation and prey. Most of the uplands are located on the levees; however, some interior land remained fallow with relatively little disturbance and was also included in the upland area calculation.

The project area is within the historic range of GGS and is hydrologically connected to historical and/or recent GGS occurrence records and therefore could potentially support this species; however, the project vicinity has recently been surveyed specifically for giant garter snake (Contra Costa Canal, Marsh Creek, adjacent ranches with habitat type and quality similar to the project site), in coordination with the U.S. Fish and Wildlife Service, and surveys were negative. Habitat on the project site was evaluated in 2005 by a species expert Laura Patterson, DWR); no giant garter snakes were observed during those evaluations. Ms Patterson concluded that the likelihood that the project area supports GGS was slim based on the land use, available habitat, and absence of a nearby population.

SPECIAL-STATUS INVERTEBRATES

VALLEY ELDERBERRY LONGHORN BEETLE, *DESMOCERUS CALIFORNICUS DIMORPHUS*
(federally listed as threatened)

All stages of the beetle’s life cycle are closely associated with elderberry shrubs and trees (*Sambucus* spp.) in a variety of habitats. In the spring adult beetles lay eggs on the plants, primarily on stems greater than one inch in diameter. When the eggs hatch the larvae bore into the stems and

feed for up to two years on the soft core of the stems. After pupation, new adults emerge and use elderberry for resting, foraging, and reproduction. Numbers of the beetle have declined due to widespread loss of streamside woodlands that support elderberry.

There are at least two *Sambucus racemosa* shrubs on the Dutch Slough site, both with multiple stems greater than one inch in diameter. The shrubs have not been searched for exit holes, but it will be assumed that they provide habitat for the beetle.

SPECIAL-STATUS INVERTEBRATE SPECIES.

The remaining invertebrates on the species list are known only from the Antioch Dunes or from vernal pool habitats, and are summarized below.

ANTIOCH DUNES INSECT FAUNA. Several special status invertebrate species occur on the Antioch Dunes National Wildlife Refuge, located approximately six miles west of the project site. Although some relict, ancient dune sand deposits (“sand mounds”) occur at the project site, there is little potential for endemic or rare insects associated with the Antioch Dunes community to occur on the project site because the Dutch Slough sand deposits are highly disturbed and vegetated with vineyard plantings, non-native grasses and weeds, and nitrogen-fixing non-native trees. They also lack key native host plants for some insects, such as buckwheat (*Eriogonum* species), minimizing their habitat suitability. Similar sand mounds on adjacent ranches (adjacent and east of the Dutch Slough project site), which did support some native sandy-soil/dune indicator plants, were assessed for the presence of rare native dune insect fauna, and were surveyed specifically for five special-status beetle taxa (Arnold 2005). The assessment covered the following insects, and concluded they were unlikely to occur on the severely degraded sand mound habitats of the Dutch Slough project site:

Lange’s metalmark butterfly, *Apodemio mormo langei* (federal and state listed as endangered). This species is associated with native buckwheat (*Eriogonum*) host plants; the species was determined to be absent from adjacent ranches south of Dutch Slough. The essential host plant is lacking at Dutch Slough.

San Joaquin dune beetle, *Coelus gracilis*. The species is presumed extinct; it was not detected on adjacent ranches south of Dutch Slough.

Ciervo Aegialian scarab beetle, *Aegialia concinna*. It is unlikely the species is present in degraded habitat, but surveys may be warranted; surveys detected none on adjacent ranches south of Dutch Slough.

Antioch and Sacramento anthicid beetles, *Anthiscus antiochiensis*, *A. sacramento*. There is suitable loose sand habitat on the project site, but these ground-dwelling beetles were not detected in surveys of similar habitats of adjacent ranches south of Dutch Slough. They are unlikely to occur.

Antioch mutillid wasp, *Myrmosula pacifica*. This ground-nesting, sand-loving wasp (which may be a synonym of a widespread species) was not detected on adjacent ranches south of Dutch Slough, but some potential habitat occurs in degraded sand mounds of the project site.

Molestan blister beetle, *Lytta molesta*. This beetle parasitizes sand-loving, ground-nesting bees. The species was not detected on adjacent ranches south of Dutch Slough, but some potential habitat occurs in degraded sand mounds of the project site.

Yellow-banded and Antioch andrenid bees, *Perdita scitula antiochiensis*, *P. hirticeps luteocincta*. Loose sand habitat is present for these ground-nesting bees, but none were detected none on adjacent ranches south of Dutch Slough. Their preferred nectar plant assemblages do not occur at the project site.

Antioch Cophuran, Efferian, and Hurd's Metapogon robberflies, *Cophura burdi*, *Eferia antiochi*, and *Metapogon burdi*. These endemic Antioch Dunes robberflies are presumed extinct. They were not detected on adjacent ranches south of Dutch Slough, east of the project site.

Antioch and redheaded sphecid wasps, *Philanthus nasalis* and *Encerceris ruficeps*. These ground-dwelling sand-substrate wasps have some potential to occur in sand mounds, but cattle or vehicle disturbance may reduce habitat quality. They were not detected none on adjacent ranches south of Dutch Slough.

VERNAL POOL INVERTEBRATE FAUNA.

Most of the vernal pool invertebrates are also unlikely to occur at the Dutch Slough project site because there are few ponded areas in the project site that hold water for more than a few days (Brent Gilbert, pers. comm., March 2008). In most cases, clay soil is necessary to hold water in vernal pools, and there is little clay at the project site. Seasonal wetlands at the project site are due more to local runoff and high water tables than from the characteristics of the underlying soil. However, seasonally wet areas have some potential to be occupied by some sensitive invertebrates.

CURVE-FOOTED HYGROTUS DIVING BEETLE, *HYGROTUS CURVIPES*. This species inhabits alkali vernal pools and other seasonal wetlands or slow moving streams with pools and fringed with alkali vegetation. Adults are about an eighth of an inch long, with males being slightly larger than females. This species is known only from Contra Costa, Alameda, and northwest San Joaquin counties, at the western edge of the Central Valley. This aquatic beetle may occur in suitable habitats at the project site, but it was not detected in surveys in highly similar habitats at adjacent ranches south of Dutch Slough, east of the project site (Arnold 2005).

VERNAL POOL FAIRY SHRIMP, *BRANCHINECTA LYNCHI*. (Federally listed as threatened) A small (11-25mm) crustacean found in vernal pools. The majority of known populations inhabit vernal pools with clear to tea-colored water, most commonly in grass or mud bottomed swales or basalt flow depression pools in unplowed grasslands. One population is known from an alkaline vernal pool. The species has been found from early December through early May, and is only rarely found with other fairy shrimp species. (USFWS 1994--Determination of Endangered Status for the Conservancy Fairy Shrimp, Longhorn FS, and Vernal Pool Tadpole Shrimp; and Threatened Status for the VP Fairy Shrimp. Federal Register Vol 59, No. 180 9/19/94.) This species is known from Contra Costa County and there may be habitat for it in the alkaline wetlands on the Dutch Slough Project site.

Similar species that are less likely to occur on the project site include California linderiellia, *Linderiellia occidentalis*; Longhorn fairy shrimp, *Branchinecta longiantenna*, (federally listed as endan-

gered); midvalley fairy shrimp, *Branchinecta mesoamericana*; and the vernal pool tadpole shrimp, *Lepidurus packardii*, (federally listed as endangered). Wet-season branchiopod surveys conforming to methods and protocols accepted by the U.S. Fish and Wildlife Service were performed in apparently suitable seasonal wetland habitats of adjacent ranches, but no branchiopods were detected (Dexter 2005).

Regulatory Setting

Assessment of impacts to biological resources at the Dutch Slough Restoration Project and Related Project sites is subject to many public policies, regulations, and laws affecting biological resources. These are described briefly below in the context of the proposed project.

FEDERAL LAWS, REGULATIONS, POLICIES

CLEAN WATER ACT (33 U.S.C 1252 *ET SEQ.*)

The Clean Water Act is a federal law aimed overall at restoring and maintaining the chemical, physical and biological integrity of United States waters, by reducing or eliminating discharges of pollutants that degrade aquatic resources. The pertinent section of the Clean Water Act in the context of fill placement in wetlands and wetland restoration is Section 404. The regulations for Section 404 prepared by the Environmental Protection Agency (EPA) implement specific policies for discharges of earthen fill materials in wetlands: these are known as the “404(b)(1) Guidelines” (40 C.F.R. Part 230). In addition, the preamble to the Guidelines published in the Federal Register articulates EPA policies specific to discharges of fill for the purpose of habitat construction, such as wetland restoration (Federal Register Vol. 45, No. 249, December 24, 1980, p. 85344, “Habitat Development and Restoration of Water Bodies”). These specific policies as well as the Guidelines are pertinent to the Dutch Slough project.

The 404(b)(1) Guidelines describe exceptions to a general rule that fill should not be discharged in waters of the United States if there is a practicable alternative that would overall have less adverse impact on aquatic resources. They presume that for special aquatic sites like wetlands, practicable alternatives to fill discharges in wetlands are available unless otherwise demonstrated. The Guidelines also prohibit discharges of fill that may cause or contribute to “significant degradation” of U.S. waters, or discharges that may jeopardize a federally listed endangered or threatened species. Finally, for approved fill discharges in U.S. Waters, the Guidelines require that practical steps must be taken to minimize impacts (mitigation; Subpart H). The Guidelines require detailed factual determinations (40 C.F.R. Section 230.11, Subparts C-F) to support permit decisions that must comply with the Guidelines, including physical, chemical, and biological impacts, impacts to special aquatic sites (wetlands, mudflats, refuges, mudflats, vegetated shallows, etc.), and impacts to human uses. These factual determinations identify the specific functions and values of aquatic habitats that must be evaluated for impacts of proposed fill. Permits for fill discharges subject to Section 404 are issued by the U.S. Army Corps of Engineers, with some programmatic oversight from EPA. The Army Corps is authorized to issue a Section 404 Permit for the discharge of dredged or fill material into waters of the U.S., provided that such discharges are found to be in compliance with the Sections 401 and 404(b)(1) guidelines published by the U.S. Environmental Protection Agency.

The Dutch Slough Restoration Project restoration alternatives all propose variable amounts of fill in existing non-tidal wetlands, all of which have been determined to be within Federal jurisdic-

tion; the U.S. Army Corps of Engineers verified the DWR wetland delineation (2006) that took federal jurisdiction over non-tidal wetlands on site (pasture). The overall purpose of the Dutch Slough project is to restore tidal wetlands, increase the net extent and quality (ecological function) of U.S. Waters in the long term. This is consistent with the “Habitat Development and Restoration” policies of EPA discussed in the preamble of the Guidelines. These policies also advise against substituting one viable aquatic habitat for another, and recommend selection of “obviously degraded or significantly less productive habitats” for restoration. In addition, the EPA recommends experimental approaches analogous with “adaptive management” principles that were integral to the development of the Dutch Slough design process and scientific peer review.

NATIONAL ENVIRONMENTAL POLICY ACT OF 1969 (42 U.S.C. §§ 4321 *ET SEQ.*)

The National Environmental Policy Act’s (NEPA) basic purpose is to ensure that the quality of the human environment is considered in federal decisions, and to promote enjoyable harmony between humans and their environment. In practice, NEPA works as a formal procedure for federal agency decision-making and documentation. Federal agencies develop and implement their own specific NEPA regulations regarding procedures for evaluating and documenting environmental impacts. NEPA requires that agencies consider alternative actions that minimize conflicts between project objectives and environmental quality, and promotes selection of environmentally preferable alternatives. NEPA establishes methods for mitigation based on avoiding, minimizing, and correcting environmental impacts. It emphasizes significant environmental issues and impacts over details and paperwork, and promotes plain language, and public involvement in the public environmental review process. The EPA provides oversight for NEPA compliance of individual federal agencies.

NEPA encourages integration between state and federal environmental review procedures, such as joint EIR/EIS documents when both state and federal lead agencies determine that significant impacts may occur, and require preparation of EIR/EIS documents. This EIR was prepared prior to formal determination of the federal lead agency status for permitting, but, as described in Chapter 1, Introduction, is formatted to facilitate its use as an EIS. It anticipates the perspective of NEPA, but is not prepared under the guidelines of a federal lead agency or Environmental Protection Agency.

NEPA does not have specific, substantive policies for federal decisions about particular biological resources, such as those of the Endangered Species Act and Clean Water Act. It does, however, specifically identify positive or negative impacts to Endangered Species as an important factor for determining whether an impact is significant (40 C.F.R. Section 1508.27).

RIVERS AND HARBORS ACT OF 1899 (33 U.S.C. 403, SECTION 10)

The Rivers and Harbors Act of 1899 is principally concerned with regulation of any work or structures navigable waters and impacts to navigation, but “navigable waters” in law is broadly defined to include all tidal waters. Permits authorizing work or structures under this law are issued by the U.S. Army Corps of Engineers, whose permit process also includes Clean Water Act Section 404 authorization and a consolidated public interest review of factors affecting both laws. Rivers and Harbors Act jurisdiction may in some cases expand the overall federal jurisdiction of the Corps, and may trigger other federal environmental laws.

In the Dutch Slough Restoration Project design, the breaching of levees and restoration of tidal flows would be subject to regulation under the Rivers and Harbors Act.

ENDANGERED SPECIES ACT (16 U.S.C. 1531 *ET SEQ.*)

The Endangered Species Act of 1973, as amended (ESA) establishes a national program for conservation (survival and recovery) of species listed as threatened or endangered, and the ecosystems on which they depend. The sections of ESA that apply to the proposed project are Section 4, Section 7, and Section 9. The U.S. Fish and Wildlife Service (Department of Interior) and the National Oceanic and Atmospheric Administration - Fisheries (NOAA Fisheries) are responsible for implementing the Endangered Species Act. Listed plants, wildlife, and non-anadromous fish species are regulated by the U.S. Fish and Wildlife Service, and listed anadromous fish species and marine mammals are regulated by NOAA.

Section 4 of the ESA requires that listed species have federal plans for their recovery, including practical steps for implementation. By policy, recovery plans also include ecosystem restoration objectives and objectives for conserving species of concern that may become threatened or endangered. Federal agencies have an affirmative obligation to use their discretion to further the recovery of listed species by cooperating with the implementation of recovery plans recommendations.

Section 7 of the ESA requires that federal agencies must consult with the Service or NOAA if their actions may affect a federally listed species. Section 7 also prohibits any federal agency from taking actions that are likely to jeopardize the survival and recovery of listed species. Issuance of a federal permit is one type of action that may trigger the requirement to initiate Section 7 consultation. The Service or NOAA conclude formal Section 7 consultation with the issuance of a biological opinion. The biological opinion may also include an “incidental take statement”. The incidental take statement provides authorization for incidental “take” (indirect killing, harm, harassment, injury) of listed fish or wildlife species that is otherwise prohibited by Section 9 of the ESA.

The proposed Dutch Slough Restoration Project includes actions recommended by recovery plans. Construction of the tidal wetland restoration project may have long-term beneficial effects on the recovery of some federally listed endangered species, and also some short-term adverse effects.

MIGRATORY BIRD TREATY ACT (16 U.S.C. 703 *ET SEQ.*)

The Migratory Bird Treaty Act governs the “taking” of migratory birds, their eggs, parts, and nests. Actions that harm or kill migratory birds (including their essential feeding, roosting, nesting behaviors) are regulated by the Migratory Bird Treaty Act. Construction activities associated with engineering of wetland restoration may affect migratory birds.

EXECUTIVE ORDER 13112, INVASIVE SPECIES

This Executive Order inaugurated the National Invasive Species Management Plan and National Invasive Species Council (Council) in 1997. It provides policy direction to promote coordinated efforts of federal, state, and local agencies in monitoring, detecting, preventing, evaluating, managing, and controlling the spread of invasive species and increasing the effectiveness of scientific research and public outreach affecting the spread and impacts of invasive non-native species.

The Dutch Slough Restoration Project has objectives to minimize the spread of invasive species, but also carries some unavoidable risks of increasing the spread of some invasive species.

EXECUTIVE ORDER 11988, FLOODPLAIN MANAGEMENT

This Executive Order directs federal agencies to avoid long-term and short-term adverse impacts of development in floodplains, to the extent practical. The purpose of this policy is to minimize the risk of flood losses, risk to human safety, health, and welfare. An inherent consequence of this policy is to promote retention of undeveloped floodplains in conditions suitable for wetlands. As described in Section 3.1, the proposed project occupies a portion of the Delta landscape that is subject to extensive floodplain development.

STATE OF CALIFORNIA LAWS, REGULATIONS, AND POLICIES**CALIFORNIA ENDANGERED SPECIES ACT (FISH AND GAME CODE SECTION 2050 *ET SEQ.*)**

The state equivalent of the federal Endangered Species Act, CESA has similar, but distinct requirements and goals. CESA requires State agencies to coordinate with the California Department of Fish and Game to ensure that state-authorized or state-funded actions do not jeopardize a state-listed species. The state list of species classified as rare, threatened, or endangered does not correspond with the federal list of threatened and endangered species. CESA prohibits unauthorized “take” of a state-listed species.

The Fish and Game Code also includes a less familiar special legal status for some species as “fully protected”, a category developed before CESA was authorized. Most “fully protected” species have been placed on the state list of rare, threatened, or endangered species, but some have not. Prohibitions against take of older “fully protected” species are more stringent and inflexible than those of CESA, generally prohibiting nearly all “take”, and providing no instrument to authorize “take” except for recovery and research actions. Fully protected species regulations in the Fish and Game Code are found at §3511 for birds, mammals at §4700, reptiles and amphibians at §5050, and fish at §5515 and California Code of Regulations, Title 14, Division 1, Subdivision 1, Chapter 2, Article 4, §5.93. The category of Protected Amphibians and Reptiles in Title 14 has been repealed.

CALIFORNIA NATIVE PLANT PROTECTION ACT (FISH AND GAME CODE SECTION 1900 *ET SEQ.*)

In addition to the California Endangered Species Act, the Native Plant Protection Act (NPPA) protects endangered and “rare” species, subspecies, and varieties of native California plants. The species listed under this law, which preceded CESA, now overlap with those of CESA. NPPA contains many exemptions for agriculture and forestry, and many exceptions, but it otherwise generally prohibits unauthorized “take” of listed plants. NPPA contains “notice and salvage” provisions that require landowners to notify CDFG to “salvage” (rescue by transplanting – a technique no longer generally scientifically supported) listed plants in the path of land-clearing or development activities.

PORTER-COLOGNE WATER QUALITY CONTROL ACT (CALIFORNIA WATER CODE SECTION 13000 *ET SEQ.*; C.C.R. TITLE 23, CHAPTER 3, CHAPTER 15)

The Porter-Cologne Water Quality Act provides the state with broad jurisdiction over water quality and waste discharge, and also provides the state the authority to prepare regional Basin Plans that identify “beneficial uses” of state waters that expressly include biological resources such as wetlands, fish, and wildlife conservation. Biological “beneficial uses” of state waters are subject

to regulation through various means, including mandatory conditions attached to state water quality certification of federal Clean Water Act (Sections 401, 404) authorizations. The Regional Water Quality Control Boards frequently provide Porter Cologne compliance with wetland beneficial use policies by attaching mandatory conditions to Section 401 certification for U.S. Army Corps of Engineers permits for fill discharges in federal jurisdictional wetlands.

EXECUTIVE ORDER W-59-93, CALIFORNIA WETLANDS CONSERVATION POLICY

This state policy established by the Governor of California in 1993 provides substantive environmental goals to ensure no overall net loss of wetlands, to achieve a long-term net gain in the quantity, quality, and permanence of wetlands in California, with due concern for private property and stewardship. The basic purpose of the Dutch Slough Restoration Project implies a significant long-term net gain in the quantity, quality and permanence (dynamic stability) of wetlands, consistent with this policy

FISH AND GAME CODE SECTION 1600 *ET SEQ.* (STREAMBED ALTERATION AGREEMENTS)

The California Legislature repealed and re-enacted with modification this section of the Fish and Game Code in 2003. It has as its primary purpose the protection of the state's fish and wildlife resources from harmful impacts of activities that occur near any rivers, streams, lakes and other water bodies in the state, regardless of the amount or duration of flow. "Fish" are broadly defined in the Fish and Game Code (Section 45) as aquatic organisms, including mollusks, crustaceans, invertebrates, or amphibians. Prior to undertaking stream-altering activities that may adversely affect fish or wildlife, applicants must notify the Department of Fish and Game, pay fees, and enter into an agreement with the Department for authorization. The Department may authorize (for up to 5 years) alteration of streams with scientifically sound, reasonable conditions to avoid or minimize harm (substantial adverse effects) and protect fish and wildlife resources. The Department has discretionary authority to modify the conditions of a Section 1600 Stream Alteration Agreement.

LOCAL LAWS, REGULATIONS, AND POLICIES

CITY OF OAKLEY HERITAGE TREE PRESERVATION

The City of Oakley Municipal Code sections 9.1.1112-1114 address the protection and preservation of heritage and protected trees, and outline the actions necessary to obtaining permits for removal of protected trees.

3.4.2 IMPACTS AND MITIGATION

Significance Criteria

The significance of biological impacts to terrestrial and wetland biological resources depends partly on the regulatory setting (policy, regulation, statute; see Regulatory Setting), and partly on the context of the scientific literature on ecology, conservation biology, and related environmental sciences. The following criteria are proposed as thresholds of significance for adverse environmental impacts in the context of CEQA:

- Extirpation (local extinction) of a population of a rare, threatened, or endangered species, or substantial contribution to the reduction of its natural geographic range (contraction of its distribution, or elimination of disjunct [outlier] populations) population viability, or population size.
- Degradation of habitat occupied by a rare, threatened, or endangered species, to the point at which its population declines or becomes unstable.
- Artificial introduction or range extension of a rare, threatened, or endangered species to plant communities or floristic provinces in which it did not occur historically.
- Substantial reduction in distribution or abundance of a species of concern, relative to its regional and local distribution.
- Loss or substantial reduction in area or distribution of a unique or rare plant or animal community.
- Major incremental loss of a widespread plant or animal community that is undergoing very rapid decline at a regional or subregional scale.
- Substantial loss of composition or structure in a plant or animal community that is very old or mature, and very slow or uncertain to regenerate over many human generations.
- Major increase in the distribution, rate of spread, abundance, or impact of an invasive non-native species.
- Major, long-term change in biogeochemical processes or productivity.
- Major, long-term reduction in diversity of native species and communities

Significance criteria for impacts to special-status species consider potential impacts to existing populations (direct and indirect impacts), impacts to suitable but unoccupied habitat of special-status species with narrow habitat requirements or very limited distribution, and impacts to high-priority recovery areas or critical habitat (cumulative impacts). Impacts to special status plant species that are certain or likely to cause local population extinction, or major long-term declines in local population size or stability, are considered significant.

Significance determinations for impacts to special-status plants consider potential impacts to existing populations (direct and indirect impacts), impacts to suitable but unoccupied habitat of special-status species with narrow habitat requirements or very limited distribution, and impacts to high-priority recovery areas or critical habitat (cumulative impacts). Impacts to special status plant species that are certain or likely to cause local population extinction, or major long-term declines in local population size or stability, are considered significant.

Background and Considerations in Impact Assessment

The Dutch Slough and related Ironhouse projects propose to reverse former diking and reclamation of historic tidal marshes by breaching dikes and restoring tidal flows over artificial non-tidal habitats. Artificial non-tidal habitats may include wetlands or terrestrial habitats with important ecological functions, including significant wildlife habitats for waterfowl, shorebirds, mammals, plants, amphibians, reptiles, and invertebrates. Some ecological functions and species supported

by diked, reclaimed habitats partially emulate those of pre-reclamation wetland ecosystems. Some special-status species may establish populations or important refuge habitats in diked, reclaimed historic tidelands. The impacts of large-scale habitat conversions associated with tidal restoration depend on the landscape context in which they occur – relative abundance and trends of other habitats in the region surrounding the tidal restoration project.

While the general outcome of tidal conversion is predictable, ecological understanding essential to forecasting specific habitat or species changes (impacts, benefits) has practical limits, and unavoidable uncertainty. The “adaptive management” policies of CALFED agencies are aimed at addressing the inherent ecological and practical uncertainties of habitat restoration projects, using scientific experimental approaches. This approach is somewhat different from the forecasting and straightforward prediction required by CEQA analysis of impacts and mitigation.

Tidal restoration, though a gradual process of ecological succession (growth and development of ecological communities over time), is implemented via abrupt, disruptive disturbances of construction and tidal flooding. Many years or decades are required for restored tidal marshes to regenerate the ecological functions of long-established artificial non-tidal habitats they replace. This lag effect on biological resource losses due to tidal conversion, and their replacement by habitats and populations that later regenerate is considered in the impact assessment. In general, terrestrial habitat functions of reclaimed tidelands, such as those of artificial grasslands and pastures, are eliminated or significantly reduced with certainty. Some ecological functions, however, are replaced or improved rapidly by tidal restoration, but with less certainty about where, how much, and when. The “self-mitigating” aspect of tidal wetland restoration (substitution of ecological “services” provided by non-tidal wetland with those of tidal wetlands) depends on ecological succession rates, patterns and trends that are only approximately predictable in absolute time, and difficult to control experimentally at a large geographic scale. The same is true for restoration of many terrestrial habitats, such as native grasslands and dunes.

Independent variables with overwhelming ecological influence, such as climate change, species invasions, and acceleration of sea-level rise, contribute to the inherent uncertainty of ecological forecasting for specific large-scale restoration projects. The Dutch Slough Restoration Project is the largest freshwater tidal marsh restoration in California, and the first to be studied with scientific rigor. The lack of studies of other similar, local habitats constrains the EIR’s ability to forecast ecological outcomes of restoration.

Most scientific and management experience with tidal marsh restoration in the Bay-Delta region comes from San Francisco Bay salt marshes with abundant local sources of suspended fine mineral sediment, and tidal ranges (daily vertical water elevation change) well over 3 feet. (The “Bay-Delta Region” here refers to tidal San Francisco Estuary and the Sacramento-San Joaquin River delta, including reaches with little or no tidal signal). Understanding of tidal marsh restoration impacts and ecological benefits in the Bay-Delta is based on several decades of experiences mostly from the “lower estuary” (San Francisco Bay, San Pablo Bay), where extensive mudflats serve as large reservoirs of mobile fine mineral sediment. Typical consequences of breaching levees of subsided, diked, reclaimed lands of the lower estuary includes: relatively rapid mineral (bay mud) sediment deposition over relatively shallow (slightly below sea level) subsided ground elevations, and rapid establishment of “pioneer” native marsh vegetation. Submerged aquatic vegetation in salt marshes of the lower estuary is very limited (restricted to pools), and consists mostly of benign native species.

In contrast, Delta tidal wetlands (predominantly freshwater tidal marshes east of Antioch) have negligible rates of fine mineral sediment deposition to rebuild tidal marshes, and have significantly lower tidal energy than wetlands of the lower estuary. Marsh-building processes in the Delta depend mostly on biomass production of tules (growth and accumulation of organic substrates like peat). Dominant wetland vegetation in the Delta includes rapid invasion by non-native submerged aquatic vegetation with adverse effects on aquatic habitat quality. Marsh zonation (segregation of different dominant vegetation types along environmental gradients, such as elevation) in the Delta, where low vertical tidal range and negligible local salinity gradients prevail, is less pronounced than in the lower estuary. These contrasts make even rough prediction of marsh habitat development more difficult for the Delta than in San Francisco and San Pablo Bay because it is more influenced by biological processes than physical ones.

The impact assessment of biological resources for this project is based on experience of tidal marsh restoration in the Bay-Delta region, the best available scientific data and literature, and unpublished local biological survey information, expert opinion, and professional judgment.

Alternative 1: Minimum Fill

IMPACT 3.4.1-1.1: POTENTIAL IMPACTS TO WILDLIFE IN IRRIGATED PASTURE AND RUDERAL-TERRESTRIAL HABITATS (DUTCH SLOUGH AND ALL OPEN-WATER OPTIONS, CITY PARK, AND IRONHOUSE PROJECTS)

Irrigated pasture makes up approximately 750 acres of the Dutch Slough project site, and there is approximately 250 acres of miscellaneous upland habitats. Alternative 1 would convert most of these terrestrial habitats on the three parcels (including jurisdictional seasonal wetlands in irrigated pastures) to freshwater marsh or open water habitats. These terrestrial habitats support common wildlife such as rodents, black-tailed jackrabbits, coyotes, and raccoons, as well as almost all the sensitive species (plant, invertebrate, and wildlife) that occupy the project sites. Several bird species, both common and sensitive, are ground-nesters on site. All these species would experience short-term habitat loss; the loss would be permanent for many of them. Permanent loss would be a significant impact.

For the sensitive species supported by terrestrial habitats, large-scale habitat conversion to marsh would be a significant impact. A few of these species, such as white-tail kites and northern harriers (Impacts 3.4.1-10), may be able to utilize some or most freshwater marsh as foraging habitat, which may offset some of the impact of the loss of terrestrial habitats. In addition, some species, such as tricolored blackbird, yellow-breasted chat, and California black rail, may realize significant habitat improvements after tidal restoration when wetland vegetation becomes established.

There would be a significant loss of terrestrial acreage in all three project “build” alternatives, but Alternative 1 would retain the largest acreage of terrestrial habitat, and maintain it in a consolidated block in the southern Emerson Parcel. This would probably act as a refuge for terrestrial wildlife species in the long term. However, the amount of remaining on-site terrestrial habitat in Alternative 1 would be insufficient to fully compensate for the loss of terrestrial habitats.

“NO BURROUGHS” OPTION

In this option, the Burroughs parcel would remain as terrestrial and wetland habitats. This would reduce the loss of irrigated pasture and terrestrial habitats by approximately 350 acres.

MITIGATION 3.4.1-1.1: AVOID AND MINIMIZE EFFECTS OF LOSS OF IRRIGATED PASTURE AND RUDERAL HABITATS THROUGH PROJECT TIMING AND PHASING

Although mitigation for loss of irrigated pasture and ruderal habitats is not required, per se, this loss does impact Swainson's hawk and other special status species. Off site mitigation is proposed for those species in Mitigation 3.4.1-8.1.

Effects on resident wildlife shall be minimized through project timing and phasing.

- Earthmoving shall be minimized during the breeding season (March through August). If earthmoving must be done during this time, those areas shall be de-vegetated prior to the breeding season to discourage nesting and denning.
- The project shall be phased so that impacts to terrestrial habitats do not occur throughout the project area all in the same year.

IMPACT SIGNIFICANCE AFTER MITIGATION

If sufficient quality and quantity of off-site compensatory mitigation habitats are acquired in appropriate geographic settings, impact would be less than significant.

IMPACT 3.4.1-1.2: WILDLIFE DISTURBANCE (DIRECT AND INDIRECT) ON TERRESTRIAL HABITATS ASSOCIATED WITH RECREATION (DUTCH SLOUGH AND CITY PARK PROJECTS)

Wildlife within retained terrestrial habitats within the Dutch Slough, Ironhouse, and City Park sites would be affected by the public access trails and new City Park. The public access trail encircling the Emerson Parcel would distribute human disturbances along the edge of relatively narrow terrestrial habitat patches, reducing the extent of undisturbed, contiguous blocks of habitat, which may disturb any wildlife inhabiting these areas. Such disturbance can disrupt foraging, feeding, sheltering, and all aspects of reproduction.

Increased park uses and food waste associated with increased visitor use to parks would probably increase local populations of ravens (*Corvus corax*), crows, gulls, raccoons, rats (*Rattus* spp.), and skunks (*Mephitis mephitis*). These artificially inflated predator populations may concentrate their impacts on resident wildlife of the remaining, reduced terrestrial habitats compressed near trails and park areas. This would be a significant cumulative impact: despite restoration with native vegetation, the reduced terrestrial habitats may have disproportionately reduced wildlife value.

MITIGATION 3.4.1-1.2: HABITAT ENHANCEMENT TO OFFSET HABITAT LOSS AND DISTURBANCE ON TERRESTRIAL HABITATS ASSOCIATED WITH RECREATION

Alternative 1 includes terrestrial habitat that would be retained and restored as terrestrial grassland. In addition, the project would restore riparian woodland habitats and low upland islands within restored freshwater tidal marshes. These internal terrestrial habitat restoration features would offset some, but not most, of the wildlife impact of terrestrial-marsh habitat conversion. Because groundwater elevations of terrestrial habitats are expected to adjust to sea level after tidal restoration, the character of terrestrial grassland in much of the area may be alluvial grassland with dense perennial vegetation. This may further reduce the availability of relatively arid, sparse grassland and ruderal wildlife habitat.

As part of the final Dutch Slough Restoration Project restoration plans, a terrestrial wildlife habitat enhancement and phasing plan shall be prepared and implemented by DWR according to the following criteria for on-site actions to offset the impacts to wildlife dependent on irrigated pastures (including seasonal wetlands) and ruderal terrestrial habitat:

DWR shall modify the terrestrial habitat restoration component of the phased proposed Dutch Slough project by incorporating the following habitat enhancement elements to emulate and sustain equivalent habitat functions of moist pasture and ruderal vegetation:

- (i) distribute enhanced natural or naturalistic cover features (brush piles, coarse and fine woody debris) in scattered patches throughout most terrestrial habitat;
- (ii) retain the maximum number of native on-site native riparian (levee) and upland trees, and retain some snags of killed trees scheduled for eradication;
- (iii) salvage and relocate large snags and logs removed from wetland restoration parcels to install within restored or enhanced terrestrial habitats; and
- (iv) restore or manage terrestrial grasslands to include diverse grassland types, including perennial sod-forming stands (such as creeping wildrye/saltgrass grassland near wetland edges), regionally native forb-dominated stands (such as annual tarweed, spikeweed, lupine, goosefoot family annual forbs, etc.) and regionally native scrub and forb vegetation adapted to sandy soils.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.1-1.3: WILDLIFE DISTURBANCE FROM LIGHTING AND NOISE (CITY PARK)

Park lighting and noise could adversely affect certain wildlife species that are sensitive to human intrusion. Lighting interferes with movements of insects and migratory birds; attracts insects, increasing their vulnerability to predation; disrupts hunting of other predators; and interferes with circadian rhythms of wildlife. Noise can disrupt foraging, feeding, sheltering, and reproduction. These could be potentially significant impacts.

MITIGATION 3.4.1-1.3: REDUCE EFFECTS OF CITY PARK LIGHTING AND NOISE

Mitigation for this issue is provided in Sections 3.7, Noise and 3.8, Aesthetics. In addition, these issues would be studied further in the project-level CEQA assessment for the City Park.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.1-2.1: IMPACTS OF DREDGING LITTLE DUTCH AND EMERSON SLOUGHS (DUTCH SLOUGH PROJECT WITH ALL OPEN WATER MANAGEMENT OPTIONS AND IRONHOUSE PROJECT)

Dredging is proposed as a contingency (option) to increase the tidal prism of Little Dutch Slough, and possibly Emerson Slough (in the No Burroughs" option), to minimize tidal damping in restored marshes. The desired increase in tidal prism in these channels could be accomplished by deepening or widening the sloughs, or both. Dredging may cause increased rates of fringing tidal marsh erosion along sloughs or their direct removal. This would reduce the total area of

tidal marsh habitat and increase habitat fragmentation. Widening the channel by narrowing the fringing marsh width would increase exposure of ground-nesting wildlife (such as California black rails) to adverse effects of boat wakes. Reduction of fringing marsh habitat area and quality may reduce the size and the viability of wildlife populations. This may in turn reduce the capacity of resident tidal marsh wildlife with limited dispersal ability to serve as a founder population for colonizing newly restored marsh. This is a potentially significant impact.

OPEN WATER MANAGEMENT OPTIONS

Subsidence reversal and skeletal marsh/creek options would provide the most valuable freshwater marsh habitats that contribute to habitat support for tidal marsh wildlife. Deep water would potentially increase populations of predatory fish (see Section 3.5, Aquatic Habitats) that could adversely impact viability of native marsh reptile and amphibian populations.

MITIGATION 3.4.1-2.1A: INCREASE ACREAGE OF TIDAL FRESHWATER MARSH.

In the long-term, the project is expected to “self-mitigate” many short-term significant impacts to existing tidal freshwater marsh wildlife on site, and avoid long-term significant impacts. This would occur through increases in acreage of tidal freshwater marsh, with a significant net increase in the extent of freshwater marsh habitat overall to support an increased diversity of wetland wildlife species. The extent to which this occurs would depend on many final design options of the restoration, and their consequences for wildlife.

MITIGATION 3.4.1-2.1B: AVOID CHANNEL WIDENING AND DREDGE NON-NATIVE SAV BEDS.

If existing tidal source sloughs are dredged to increase tidal flows into restored marsh, dredging plans shall avoid widening channels (direct excavation of marsh), or over-steepening banks so that significantly increased rates of marsh bank slumping occur. If dredging of existing invasive non-native SAV beds is feasible and consistent with dredging needs, non-native SAV beds shall be dredged and deepened.

In addition, implementation of Mitigation measures 3.4.1-1a would minimize impacts to wildlife in tidal freshwater marsh habitats. Effects on resident wildlife shall be minimized through project timing: all efforts shall be made to minimize dredging during the breeding season (March through August).

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.1-2.2: WILDLIFE DISTURBANCE (DIRECT AND INDIRECT) AROUND THE MARSH EDGE ASSOCIATED WITH RECREATION (DUTCH SLOUGH AND CITY PARK PROJECTS)

The construction of a permanent public access trail around the perimeter of Emerson Parcel, and the addition of a public park at the head of Emerson Slough, would likely have significant indirect effects on tidal wetland wildlife. Amenities at the park would likely provide an attractive nuisance for crows, gulls, ravens, raccoons, rats, and skunks because of food resources (garbage). These species are likely to increase in population size and increase predation pressure on nesting tidal marsh birds, particularly ground-nesting species such as rails. Increased visitor access along

trails would increase exposure of wildlife to human disturbance. Trail use would likely reduce the likelihood of establishment for egret or heron rookeries in riparian/tidal marsh edges. These are potentially significant impacts.

MITIGATION 3.4.1-2.2: HABITAT ENHANCEMENT TO OFFSET HABITAT LOSS AND DISTURBANCE AROUND THE MARSH EDGE ASSOCIATED WITH RECREATION

The final Dutch Slough and related Ironhouse Project restoration plans shall include the following specifications for implementation:

- Final designs for constructed tidal marsh shall include selective placement of large woody debris in constructed tidal sloughs and marsh ponds to provide wildlife cover, basking sites, and roosting sites for wildlife dependent on freshwater marsh bordering shallow open water habitats. Final designs for large woody debris placement shall be reviewed and approved by the DFG and USFWS.
- To protect the integrity of tidal marsh-riparian woodland edge habitat functions, placement of rock slope protection shall be minimized on outer levee slopes. If rock placement is unavoidable to prevent erosion that jeopardizes levee stability, rock-armored levee segments shall be capped with soil and revegetated with native marsh and riparian woodland vegetation. Soil-filled gaps in rock arrangement shall be included in rock-armored levee segments to provide rooting continuity with underlying levee or marsh soils and to maximize feasibility of native riparian tree and shrub planting.
- Revegetated native riparian shrub cover (primarily California blackberry and willow thicket) along existing or restored tidal marsh edges shall be made as continuous as possible along public levee trails to screen tidal marsh wildlife from visual exposure to passing human visitors.
- Timing of dredging shall avoid nesting season (March-August) to reduce impacts on breeding birds.

The following measures shall be incorporated as part of the public access components of both the Dutch Slough Restoration Project and the City Park:

- To minimize artificial attraction of predators along public access trails bordering tidal marsh wildlife habitats, food and garbage shall be prohibited on marsh levee trails. Sanitation shall be rigorously maintained in the county park to minimize attraction of scavenger/predator wildlife species.
- If rookeries or other tidal marsh bird nest sites are detected along levee trails, seasonal trail closures shall be evaluated and implemented upon consultation with USFWS and DFG.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.1-2.3: WILDLIFE DISTURBANCE (DIRECT AND INDIRECT) ASSOCIATED WITH MAINTENANCE OF EXTERIOR LEVEE (DUTCH SLOUGH PROJECT)

Levee stabilization and maintenance is proposed for some segments of levee, particularly for permanent public access trails with vehicle access. This may include placement of additional rock

slope protection. Rock slopes placed on the levee and marsh surface are likely to displace high tidal marsh wildlife habitat and associated riparian woodlands. This is a potentially significant impact.

MITIGATION 3.4.1-2.3: MINIMIZE DISTURBANCE (DIRECT AND INDIRECT) ASSOCIATED WITH MAINTENANCE OF EXTERIOR LEVEE.

In planning the project, rock placement on portions of levee with high habitat value shall be minimized. When rock placement in such areas is necessary, work will occur in the smallest possible area and construction shall be timed to avoid nesting periods of sensitive species.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant.

IMPACT 3.4.1-3: POTENTIAL IMPACTS TO NONTIDAL FRESHWATER MARSH AND RIPARIAN WOODLAND/SCRUB AND ASSOCIATED WILDLIFE SPECIES (DUTCH SLOUGH AND IRONHOUSE RESTORATION PROJECTS)

The Dutch Slough project site includes approximately 70 acres of freshwater marsh vegetation and 13 acres of riparian woodland and scrub vegetation. Impacts to wildlife of existing non-tidal freshwater marsh and riparian woodland/scrub habitats on site are likely to depend on the location of those habitats in relation to final design of project construction features. Wildlife such as egrets, herons, and reptiles are likely to depend on the cover types, substrates, and habitat structure provided by linked complexes of freshwater marsh, seasonal ponds, and riparian woodland/scrub habitat patches. Segregating impacts by individual habitat categories would understate impacts to wetland-dependent wildlife that utilize integrated marsh, riparian, and shallow open water habitats. These impacts may be significant.

Several interacting Dutch Slough project activities may impact freshwater marshes, including the following:

- Marshes located within areas to be used as on-site borrow areas for fill (not yet determined) would be destroyed along with less motile wildlife (such as reptiles and amphibians) in them, by earthmoving activities. This would be a significant short-term impact.
- If non-tidal marshes were included within proposed managed tule marsh (“pre-vegetation”, and peat-building, subsidence reversal experiments), outside the areas proposed for earthmoving, they would instead become assimilated within dynamic, expanded areas of non-tidal freshwater marshes. The original (pre-project) locations of non-tidal freshwater marshes would be “drowned” because they lie in the lowest topographic areas. The close interspersed of marsh, open water, and riparian woodland/thickets, and the specific habitat functions provided by this habitat edge, may take many years to regenerate in restored tidal marsh/upland transition zones. They may also not be replicated in “subsidence reversal” nontidal tule marshes managed for maximum productivity/peat production (see Open Water Management Options, below). If existing marsh/riparian complexes are protected during project construction and gradually flooded during restoration, they may also serve as a source population for resident wildlife colonizing managed marshes.

- When non-tidal marshes are eliminated or drained during project construction, or rapidly flooded during restoration, their ability to serve as a founder population for resident marsh wildlife in the restored marsh would be severely reduced or eliminated. This impact would necessarily occur if the most subsided locations are selected as borrow sites for project fill. These are potential significant short-term or long-term impacts.
- Amphibians and reptiles are likely to suffer significant net losses of high-value marsh habitat if restoration design is not resilient to rising sea level and fill subsidence. Marsh wildlife dependent on access to emergent marsh substrate (mammals, wading birds) may also experience significant net losses of habitat if tule cover or density is inadequate, and marsh substrate is excessively submerged for most of the tidal cycle.

In the long-term, the project is expected to “self-mitigate” many short-term significant impacts to existing non-tidal freshwater marsh wildlife on site, and avoid long-term significant impacts. This would occur through habitat replacement by tidal freshwater marsh, with a significant net increase in the extent of freshwater marsh habitat overall to support an increased diversity of wetland wildlife species. The extent to which this occurs would depend on many final design options of the restoration, and their consequences for wildlife. These final design options are probably more important influences on marsh habitat quality and wildlife than differences among project alternatives. Some critically important final design features include:

- **Texture of imported borrow sediments used as fill.** The source and type of fill for wetland restoration has not been determined. Both on-site and imported fill sources are considered. Peat and muck soils, rich in organic matter, used to construct the marsh surface are likely to result in high productivity of freshwater tidal marsh and growth of tall, dense vegetation cover. Sandy dredge spoils, however, are the most abundant and available source of fill material for wetland restoration in the Delta. Sandy sediments have less capacity to retain nutrients, and are likely to support shorter, less productive marsh vegetation with less cover. Sandy sediments are also less likely to maintain stability of channel bank habitats or ponds within marsh plains.
- **Initial marsh elevations.** Sea level rise is expected to accelerate in the period of initial marsh restoration (about 50 years). Low intertidal marsh is designed at the lower limits of tule growth at contemporary sea level. Pre-establishing tules in nontidal marshes before tidal restoration may increase their initial density at their lower limits of tidal submergence, but this density may not be sustainable with rising sea level. Similarly, middle intertidal marsh zones are subject to submergence by rapidly rising sea levels in coming decades. The ability of loose, organic freshwater marsh surfaces to adjust to sea level by producing and accumulating peat is limited, and may be outpaced by rising sea level, subsidence of engineered fill, or both. Gradual marsh submergence may reduce the ability of restored marsh habitats to functionally replace and mitigate many of the lost wildlife functions of stable emergent non-tidal marshes, regardless of net increases in marsh acreage.
- **Interim marsh protection/borrow site location.** The location of internal, on-site borrow sites for fill will directly control the impacts to resident wetland-dependent wildlife and their contribution to founder populations of the restored tidal or non-tidal wetlands.

OPEN WATER MANAGEMENT OPTIONS

Subsidence reversal option would contribute the most compensation for impacts to nontidal freshwater marsh/riparian habitat complexes. The degree to which it would compensate would depend on (a) the number of parcels on which it applied (total acreage of open water treated; and (b) the degree to which habitat diversity of managed marsh is integrated into the primary objective of primary productivity and peat accumulation/subsidence reversal. This has not been designed or evaluated.

“NO BURROUGHS” OPTION

In this option, all nontidal freshwater marsh (approximately 20 acres) and riparian woodland (approximately 7 acres) on Burroughs parcel would be preserved, and potentially enhanced.

MITIGATION 3.4.1-3: DESIGN RESTORATION PLANS TO MINIMIZE IMPACTS TO NONTIDAL FRESHWATER MARSH AND RIPARIAN WOODLAND/SCRUB AND ASSOCIATED WILDLIFE SPECIES

The final restoration plans for the Dutch Slough Restoration and related Ironhouse projects shall include the following specifications for implementation:

- On-site borrow sources of fill shall be located outside of existing freshwater non-tidal marshes on site, so that existing freshwater marsh habitats and their wetland-dependent wildlife persist as long as feasible and may disperse into restored or constructed marsh habitats during project phasing. Management for “pre-vegetation” in areas of existing nontidal freshwater marsh shall be implemented by flooding the areas gradually rather than abruptly.
- Sand or other imported fill materials that may excessively restrict primary production of freshwater marsh vegetation shall be avoided as a foundation for the upper 30 cm of constructed tidal marsh substrate. If sand is used as a foundation for marsh within 30 cm of the surface, it shall be mitigated by either (a) mixing with sufficient proportions of slurried clay and fine silt or organic muck, and deposited hydraulically so that clay-silt concentrates in surface layers; or (b) capping the surface and channel banks with clay or clay-peat substrates with earthmoving equipment or a subsequent deposit of slurried clay-silt.
- Design elevations for low intertidal marsh and middle intertidal marsh zones shall anticipate sea level rise within at least a 20-year period. Design elevations shall be established on sloping surfaces rather than flat plains at uniform elevations, so that marsh transgression results in a gradual and well-buffered distribution of marsh zones for wildlife habitats as sea level rises. Wide, gradual gradients between middle and high intertidal freshwater marsh zones are particularly important for many resident marsh wildlife species requiring access to emergent nesting habitat or flood escape habitat.
- Impacts associated with short-term loss of resident wetland-dependent wildlife and their habitats shall be reduced by replacing and enhancing habitat with high levels of structural habitat diversity (large woody debris, high channel bank construction) within constructed tidal marsh channels and ponds. Naturalistic large woody debris (snags, basking logs, debris jams, flood escape habitat, roosts for wildlife) shall be embedded within constructed marsh channel banks at selected locations in the restored marsh and tidal channel complex, as in mitigation measure 3.4.1-2. Large woody debris sources that exist on-site as

mature windbreak tree plantings (subject to mortality due to tidal flooding in marsh restoration) shall be salvaged and redistributed selectively within marsh, pond, and channel habitats, as large woody debris. The final plans for salvage and placement of large woody debris shall be coordinated with the DFG and the USFWS.

- During project construction, existing nontidal freshwater marsh/riparian edge vegetation and their hydrology shall be protected to the greatest extent feasible to retain viability of established wetland-dependent wildlife populations. If protection of existing freshwater marsh/riparian edges is not feasible, restoration designs for subsidence reversal shall be modified to enhance edge habitat of riparian scrub/woodland, shallow open water, and freshwater marsh, and diversify marsh habitat structure.
- High quality marsh edge (ecotone) edge habitat shall be maintained along the new flood control levee at the east shore of Burroughs parcel by including long (total length at least 1:1 minimum (linear) replacement ratio for existing freshwater marsh/riparian or marsh/upland perimeter) segments of “habitat levee” design features (wide, gently sloping marsh bench and riparian woodland plantings) in flood control levee design.

In addition, implementation of Mitigation measures 3.4.1-1a and 3.4.1-2a, above would minimize impacts to wildlife in freshwater marsh habitats.

IMPACT SIGNIFICANCE AFTER MITIGATION:

Less than significant with mitigation.

IMPACT 3.4.1-4: POTENTIAL IMPACTS TO ALKALI MEADOW AND SEASONAL WETLAND FLATS AND ASSOCIATED WILDLIFE SPECIES (DUTCH SLOUGH RESTORATION PROJECT WITH ALL OPEN WATER MANAGEMENT OPTIONS AND IRONHOUSE PROJECT)

The Dutch Slough project site includes approximately 55 acres of alkali meadow vegetation, and 22 acres of seasonal ponds. Populations of native invertebrates and amphibians typically associated with alkali meadow and seasonal wetlands, including uncommon or sensitive species, may be eliminated by project construction and tidal restoration. In addition to sensitive invertebrates, these habitats may be used by dabbling ducks, shorebirds, reptiles, and amphibians. These areas have not been surveyed to determine if uncommon to rare species of aquatic invertebrates, such as branchiopod species [see impact 3.4.1-22], are present on site. If these species are present, loss of these habitats would be a significant impact.

“NO BURROUGHS” OPTION

In this option, all alkali meadow (approximately 6 acres) and seasonal wetland (varies annually) on Burroughs parcel would be preserved, and potentially enhanced.

MITIGATION 3.4.1-4: RECREATE HABITAT FEATURES TO REDUCE POTENTIAL IMPACTS TO WILDLIFE OF ALKALI MEADOW AND SEASONAL WETLAND FLATS

The Dutch Slough project can compensate for wildlife impacts caused by conversion of shallow seasonal wetland habitat by incorporating surrogate habitat in the restoration design, following criteria and technical specifications, subject to review and approval by DFG and USFWS. Both existing and constructed seasonal wetlands shall consist of artificial depressions in artificially managed soils in the gently sloping marsh-terrestrial vegetation transition zones at the south end

of the site. Alkali meadow and seasonal wetland flats shall be lined with sub-saline clay soil salvaged from on-site borrow pits, and shall be compacted when wet to minimize permeability. Surface soil and inoculum (cysts, eggs, seeds, other dormant resistant structures or propagules, etc.) shall be scraped from existing alkali meadow and seasonal wetland surfaces, and shall be salvaged, stockpiled, and covered when dry. Inoculum shall be spread over constructed seasonal wetland pools, as in vernal pool restoration techniques.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.1-5.1: POTENTIAL IMPACTS TO SPECIAL-STATUS PLANTS (DUTCH SLOUGH RESTORATION PROJECT WITH ALL OPEN WATER MANAGEMENT OPTIONS AND BOTH RELATED PROJECTS)

Plant surveys conducted in 2004 throughout the project site found only Suisun aster. However, throughout the project areas there is potential habitat for a number of special status species. All three projects will remove the majority of existing vegetation, and if special status plant species were present, there is a potential for a significant impact.

“NO BURROUGHS” OPTION

In this option, all existing plant populations on the Burroughs parcel would be preserved. Although no sensitive plant species have been located on the Burroughs parcel, it could serve as a potential transplantation site for sensitive plants that need to be moved from the other parcels.

MITIGATION 3.4.1-5.1: MINIMIZE, AVOID, AND COMPENSATE FOR IMPACTS COMMON TO ALL SENSITIVE PLANTS

Mitigation for special status plant species is addressed collectively for all species, with modifications noted for individual species.

Significant impacts to special-status plant species present or likely to be present onsite shall be minimized, avoided, and contingently compensated by complying with the following:

- Pre-construction surveys: Potential habitat for special-status plant species shall be surveyed in appropriate seasons for optimal species-specific detection prior to project excavation/dredging, fill, drainage, or flooding activities associated with project construction. Survey methods shall comply with CNPS/CDFG rare plant survey protocols, and shall be performed by qualified field botanists. Surveys shall be modified to include detection of juvenile (pre-flowering) colonies of perennial species when necessary. Any populations of special status plant species that are detected shall be mapped.
- If special-status plant populations are detected where construction would have unavoidable impacts, a compensatory mitigation plan shall be prepared and implemented in coordination with USFWS or DFG. Such plans may include salvage, propagation, on-site reintroduction in restored habitats, and monitoring.

- If USFWS or DFG require propagation or transplantation, scientifically sound genetic management guidelines and protocols for rare plants shall be applied to propagation and transplant plans, possibly including the following:
 - maintain some reserve clonal stock of perennial special-status plant populations during the monitoring period to offset the risk of failure in establishing populations in the wild,
 - set aside surplus reserve seed of annual special-status plants from impacted populations
 - conduct long-term monitoring to determine the fate of managed special-status plant populations.

No special-status plant species shall be introduced to the site beyond their known historic geographic range unless such introduction is recommended in a final recovery plan or conservation plan prepared and adopted by the USFWS or the CDFG, in formal consultation with the USFWS.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.1-5.2: IMPACTS TO SPECIAL-STATUS TIDAL MARSH PLANTS OF DREDGING LITTLE DUTCH SLOUGH (DUTCH SLOUGH PROJECT)

The dredging component of Alternative 1 has the potential to significantly impact special-status plant species in tidal marsh fringing the project site.

Suisun Aster. Suisun aster colonies have been detected at the tidal edges of the Emerson parcel. Their persistence at the time of project implementation is uncertain because they are subject to extirpation and recolonization following flood control channel maintenance activities along Marsh Creek. Final design of levee improvements for the public trail system would control the potential impacts to Suisun aster, rather than project alternatives.

Direct potential impacts that eliminate existing colonies of Suisun aster at the time of construction, such as slough widening by dredging, would be adverse and significant. Indirect impacts that permanently and adversely modify suitable unoccupied existing habitat (e.g. levee armoring with rip-rap) would also be a significant impact. These potential impacts would depend on specific final project designs features that are not yet developed, and so cannot be predicted precisely.

In the long term, the proposed project has major potential for major cumulative beneficial effects on the local Suisun aster population, depending on the final design of levees and high tidal marsh edges (slopes, soils, and vegetation of restored high marsh edges of terrestrial habitats). The project proposes to revegetate portions of restored high tidal marsh with propagated Suisun aster. Natural colonization or artificial propagation and transplanting of Suisun aster to suitable constructed habitats could cause major increases in the number and persistence of local Suisun aster populations. This positive outcome would require that they be transplanted into relatively stable, compatible assemblages of native high marsh plants. This action may provide a major contribution to the conservation of the species, and possibly establish a new core population.

Depending on final design of levees retained and upgraded for public access, modification of outboard (tidal) slopes (stabilization, rock slope armor, revegetation, planting of woody riparian shrubs and trees) may also adversely affect established colonies of Suisun aster. Adverse modifi-

cation of levee slopes or fringing marsh edges may preclude colonization of previously suitable habitat (reducing population viability, potential local range of the species).

Revegetation with rare plants such as Suisun aster may also have some potential adverse effects related to genetic management and propagation of rare plants. Some rare plant populations have depleted genetic variability. If propagation of founder stock of rare Suisun aster populations is not well managed genetically by careful genetic sampling and propagation of plants with known genetic identity (source population or colony, parent plants, siblings), adverse artificial genetic patterns may become permanent features in clonal perennial colonies. Hybridization of parent stock with related Chilean aster is also a genetic risk for founder populations.

Mason's Lilaeopsis. Impacts to Mason's lilaeopsis may occur within fringing tidal marshes that may be affected by restoration engineering actions, such as channel dredging to increase tidal prism of Little Dutch Slough. Additional impacts could occur from tidal breaching of levees, levee stabilization by placement of rock slope protection, and realignment of the mouth of Marsh Creek. Any Mason's lilaeopsis occurring within these areas of impact would likely be extirpated. This would be a significant impact. Gradual, natural erosion of tidal marsh channels by increased tidal prism due to tidal restoration would probably have a beneficial effect on populations, depending on the rate of marsh bank slumping. Gradual bank slumping provides opportunities for Mason's lilaeopsis' clonal (vegetative) colonization and escape from competition by tall, robust freshwater emergent marsh vegetation.

Mason's lilaeopsis is also proposed for reintroduction to the restored habitats of the Dutch Slough Restoration Project site. Suitable habitat is unlikely to be available during early project stages (early succession tidal freshwater marsh). Translocation failure risk is likely to be high if Mason's lilaeopsis is transplanted among vigorous, tall, dense tidal marsh vegetation rather than cohesive, slumping peaty marsh banks. Design options that increase the scope of rock slope placement in channels affected by boat wakes (total length of levee treated in high scour potential environments) would probably increase impacts to this species.

Delta Mudwort. Undetected populations of Delta mudwort may occur within fringing tidal marshes that may be affected by restoration engineering actions, such as channel dredging to increase tidal prism of Little Dutch Slough. Additional impacts could occur from tidal breaching of levees, levee stabilization by placement of rock slope protection, and realignment of the mouth of Marsh Creek. Any Delta mudwort occurring within these areas of impact would likely be extirpated. This would be a significant impact. Gradual, natural erosion of tidal marsh channels by increased tidal prism due to tidal restoration would probably have a beneficial effect on populations, depending on the rate of marsh bank slumping. Gradual bank slumping provides opportunities for seedling colonization of Delta mudwort in bare, slowly eroding mud or peat banks where they may escape competition from dense, tall emergent freshwater marsh vegetation.

Delta mudwort is also proposed for reintroduction to the restored habitats of the Dutch Slough Restoration Project site. Stable suitable habitat is unlikely to be available during early project stages (early succession tidal freshwater marsh). Translocation failure risk is likely to be high if Delta mudwort is transplanted into level gaps within vigorous tidal marsh vegetation early in primary marsh succession. Failure of transplanted plants may result in net negative population growth because of seed removal from source populations. This would be a significant adverse impact. Design options that increase the scope of rock slope placement (total length of levee treated) would probably increase impacts.

“NO BURROUGHS” OPTION

In this option, tidal breaches would occur on Emerson Slough rather than Little Dutch Slough, therefore no dredging of Little Dutch Slough would occur. Additional analyses are needed to determine if dredging of Emerson Slough would be necessary. Until those analyses are completed, it is assumed that this option would require similar mitigation measures.

MITIGATION 3.4.1-5.2: MINIMIZE, AVOID, AND COMPENSATE FOR IMPACTS TO SENSITIVE SPECIES OF TIDAL MARSH PLANTS

Impacts to tidal marsh plants (Suisun aster, Mason’s lilacopsis, delta mudwort) in existing tidal habitat shall be avoided to the greatest extent feasible. If avoidance is infeasible, a compensatory mitigation plan for salvage, propagation, on-site reintroduction in restored habitats, and monitoring shall be prepared and implemented in coordination with USFWS and DFG, and subject to their approval, as for special-status plants in diked, nontidal habitats.

Also implement Mitigation 3.4.1-5.1, minimize, avoid, and compensate for impacts common to all sensitive plants.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation

IMPACT 3.4.1-5.3: IMPACTS OF LOSS OF TERRESTRIAL AND WETLAND HABITATS TO SPECIAL-STATUS PLANTS (DUTCH SLOUGH RESTORATION PROJECT WITH ALL OPEN WATER OPTIONS AND RELATED PROJECTS)

Alkali Milkvetch. Although alkali milkvetch was not detected during rare plant surveys, Dutch Slough, Ironhouse, and City Park sites do contain potentially suitable habitat in alkali meadow, seasonal subsaline to alkaline shallow ponds, and seasonal wetlands that currently exists at the project site. Avoidance of impacts to any populations discovered in seasonal wetlands on the site would be infeasible, because they would occur far below sea level, and would be flooded under any tidal restoration or open water management alternative. If previously undetected populations of alkali milkvetch in alkali/subsaline seasonal wetlands exist on the project site, they would therefore be extirpated. The probability of this occurring is low, but this species has been found in former farmed seasonal wetlands on alkali-subsaline soils after farming ceased, so it may occur at Dutch Slough parcels with suitable habitat. Loss of alkali milkvetch, if present on the site, would be a significant adverse impact.

Special-Status *Atriplex* Species. Project construction and restoration would eliminate all suitable habitat (alkali meadow, seasonal subsaline to alkaline shallow ponds, seasonal wetlands) for these species that currently exists at the site. If previously undetected populations occur mixed with more common, abundant *Atriplex* species like sparscale, they would be extirpated. The probability of this is low, but of the special-status *Atriplex* species, *A. coronata* is known to have established in a small population in similar habitat at the nearby Dal Porto South parcel in recent years, and is therefore presumed to have appreciable potential to occur at the Dutch Slough Parcel. If implementation of any of the projects caused local extirpation of a population of special-status *Atriplex* species, this would be a potentially significant adverse impact.

Big Tarweed, Congdon’s Tarplant. Undetected populations of big tarweed and Congdon’s tarplant are unlikely to occur in suitable habitat at the Dutch Slough, Ironhouse, and City Park

sites, but possible impacts would be significant if they do occur. Most existing suitable habitat at the project site occurs in arid disturbed grasslands on sandy soils above sea level. These would be difficult to protect in the course of project construction, and require extensive modification and disturbance for restoration of terrestrial grasslands.

Rose-mallow. No project impacts to wild populations of rose-mallow are likely to occur because no levee breaches or levee reconstruction/upgrade work is proposed adjacent to Dutch Slough's fringing tidal marsh, and because it is highly unlikely that rose-mallow populations persist at this location. Therefore, impacts are not expected.

If possible, rose-mallow would be re-introduced to the Dutch Slough site. There are several constraining factors to such a re-introduction, however. Because one historic locality is known from the edge of the Burroughs parcel, there is a very small chance that a population may persist; if it did, it could affect the selection of source populations for propagation and reintroduction. Sampling of rare source populations (seed, clonal divisions of rhizomes) could adversely impact populations off-site or on-site. This impact would be significant if it caused local small populations to decline or become extirpated, and this impact would be amplified if reintroduced populations were unstable and failed at the Dutch Slough Restoration Project. Improper genetic sampling of rose-mallow could cause impaired genetic viability of the reintroduced population.

Contra Costa Goldfields. No populations of Contra Costa Goldfields have been detected in plant surveys at the project site, but it is possible, though unlikely, that persistent seed banks of undetected small populations occur in alkali meadows, playa-like flats and similar seasonal wetlands. If undetected populations of Contra Costa goldfields exist on the site, construction of the Dutch Slough Restoration Project and related projects would likely eliminate them. This would be a significant impact, but it is unlikely to occur.

Delta Tule Pea. Delta tule pea is proposed for reintroduction to the restored freshwater marsh habitats of the project, but no known populations occur at the site. Perennial offsite source populations are unlikely to be impacted by seed collection for the project. Establishment of introduced delta tule pea populations to suitably restored high freshwater tidal marsh and riparian habitats at the site (within its geographic range) are likely to succeed. The Dutch Slough and related Ironhouse projects are likely to have a cumulatively beneficial effect on the conservation of delta tule pea if appropriate genetic sampling protocols for rare plants are followed in management of reintroduced populations. No mitigation is indicated for potential beneficial impacts to delta tule pea.

"NO BURROUGHS" OPTION

In this option, all existing plant populations on the Burroughs parcel would be preserved. Although no sensitive plant species have been located on the Burroughs parcel, it could serve as a potential transplantation for sensitive plants that need to be moved from the other project parcels.

MITIGATION 3.4.1-5.1: MINIMIZE, AVOID, AND COMPENSATE FOR IMPACTS COMMON TO ALL SENSITIVE PLANTS

Implement mitigation 3.4.1-5.1, above.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.1-6: POTENTIAL LOSS OF ROOSTING SITES FOR SPECIAL-STATUS BAT SPECIES (DUTCH SLOUGH RESTORATION PROJECT WITH ALL OPEN WATER MANAGEMENT OPTIONS AND CITY PARK)

Existing buildings and mature trees and snags within the project area provide potential roosting habitat for several special status bat species. If bats occupy abandoned buildings, cavity trees, or other structures associated with former dairy ranch occupancy, they would be disturbed, displaced, and their local habitats diminished or destroyed. If no alternative habitats are available, displacement of bat colonies may cause increased mortality of local populations. If special status bat species are present, these would be significant impacts.

“NO BURROUGHS” OPTION

Most of the buildings and large trees found on the Dutch Slough project site are located on the Burroughs parcel. Therefore, it is likely that bats roosting on the project site would be found on the Burroughs parcel. If the “no Burroughs” option were exercised, all trees will be preserved, and the potential exists to preserve bat-occupied buildings as well, which would significantly reduce impacts to bats.

MITIGATION 3.4.1-6: MINIMIZATION AND COMPENSATION FOR POTENTIAL IMPACTS TO SPECIAL-STATUS BAT SPECIES

Pre-construction (or pre-building-demolition) surveys for roosting bats shall be conducted by a qualified biologist within 30 days prior to any removal of trees or buildings. If active roosts are not found, no further action would be warranted. If bats are detected, project plans shall specify that some derelict buildings shall be retained as long as possible, and replaced with functionally equivalent or superior artificial bat roost or nursery structures that are more compatible with adjacent park and human visitors. Monitor surrogate artificial habitats to determine their effectiveness as alternative bat habitats for all species impacted.

If an active maternity roost is located, in a building or tree that cannot be preserved, demolition or removal can only take place before maternity colonies form (prior to March 1) or after young have left the colony (after July 31). If a hibernaculum is found, demolition or removal can only take place after hibernation has terminated (typically between April and September). Disturbance-free buffer zones as determined by a qualified biologist in consultation with DFG will be observed during the maternity season (March 1 to July 31) or hibernation season (October 1 to April 30). Bats may be evicted from other roost sites, under the direction of a qualified biologist, by opening the roost to introduce airflow, or by installing one-way structures to allow the bats to leave the roost but not to re-enter it. Removal or demolition of trees or structures will occur only after it is established by a qualified biologist that bats are no longer present.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.1-7: POTENTIAL IMPACTS TO COOPER'S HAWK (DUTCH SLOUGH RESTORATION PROJECT WITH ALL OPEN WATER MANAGEMENT OPTIONS AND CITY PARK PROJECTS)

Cooper's hawks are known from the project area, though on-site nesting was not observed during bird surveys in 2005 and 2008. Dutch Slough Restoration Project and City Park construction would eliminate many large, mature windbreak trees and old ornamental planted trees that provide potential nesting habitat for Cooper's hawk. This would be a potentially significant short-term and long-term impact. The intensity of impact would depend on the population size and level of habitat use at the time of construction.

"NO BURROUGHS" OPTION

The majority of the large trees suitable for raptor nesting within the project area are located on the Burroughs parcel. Thus, exercising this option would result in a significant reduction in impacts to nesting Cooper's hawks.

MITIGATION 3.4.1-7: MINIMIZATION, AVOIDANCE, AND TREE REPLACEMENT FOR POTENTIAL IMPACTS TO COOPER'S HAWK.

Nesting trees are the most important habitat component for Cooper's hawks in the project area. Focused annual surveys shall be conducted, beginning in 2008, to estimate the level of use and local population size of Cooper's hawks (and other nesting birds) prior to commencement of any construction activity that would affect nesting Cooper's hawks. Focused surveys shall be used to prioritize the sequence of habitat retention and disturbance during project construction phasing.

If nesting Cooper's hawks are observed on site during the pre-construction surveys, DFG will be consulted regarding appropriate avoidance and mitigation measures to meet the specific needs of the nesting birds. Measures may include establishing a buffer zone around occupied trees, adapting restoration plans or timing to preserve nesting trees, or delay of construction disturbance until after young have fledged.

Short-term impacts cannot be mitigated because existing tree habitats lie mostly below sea level. Long-term impacts shall be mitigated by riparian woodland restoration and enhancement design of the restoration project. Native coast live oak woodland groves, and individual oaks shall be included in terrestrial habitat restoration to enhance efficacy of mitigation for raptor habitat. Mature existing trees shall be retained in the community park, including decadent trees and non-invasive non-native ornamental/shade/windbreak trees.

No trees will be removed during the nesting season. In addition, implementation of Mitigation measures 3.4.1-1 and 3.4.1-11 would minimize impacts to Cooper's hawks.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation

IMPACT 3.4.1-8: LOSS OF SWAINSON'S HAWK FORAGING AND NESTING HABITAT (DUTCH SLOUGH WITH ALL OPEN WATER OPTIONS AND BOTH RELATED PROJECTS)

General habitat types were assessed during the 2005 wetland delineation, and these data, along with visual assessments, were used to quantify Swainson's hawk habitat at Dutch Slough. Two delineated habitats are used by Swainson's hawks for foraging: 'seasonal farmed wetland' and 'alkali meadow'

wetland', which make up 803 acres at Dutch Slough. In practice, both of these habitats are irrigated pasture, which is moderate to poor quality foraging habitat (Estep, 1989). Alfalfa and hay crops provide higher quality foraging (Estep, 1989), but these crops are only grown at Dutch Slough occasionally and in minimal acreage. Since the delineation in 2005, there has been an increase in acreage of some bunch grass species (primarily *Lolium* sp.), and this vegetative structure does not provide good foraging opportunities. This indicates that the foraging quality at the site may be decreasing. There are a number of trees suitable for Swainson's hawk nesting at Dutch Slough, though not all of them are found within the 7 delineated acres of riparian forest.

Avian surveys were conducted in 2005 and 2008. During both surveys, Swainson's hawks were seen foraging in all three parcels, though always few in number (usually just one or two at a time). During the 2005 survey, there were two pairs of Swainson's hawks nesting on the property: one on the north end of the Emerson parcel and one in the southeast of the Gilbert parcel. During the 2008 survey, a single pair nested near the house at the center of the Burroughs parcel.

Swainson's hawks use the project sites for both nesting and foraging. Therefore, development of the Dutch Slough Restoration Project, and the related City Park and Ironhouse Restoration Project would abruptly eliminate most of the open foraging habitat present in pastures and ruderal vegetation of the project sites. This would be a direct significant impact because alternative habitat is declining around the project site because of extensive residential development, causing resident birds to expend more energy and time searching for and traveling to alternative foraging areas. The cumulative decline of productive lowland pasture habitat for Swainson's hawk in the project vicinity is significant: all lowland pastures between Big Break and Sand Mound Sloughs have been converted to other land uses with low or no foraging potential for this species.

Alternative 1 would retain the largest acreage of terrestrial habitat, and maintain it in a consolidated block in the southern Emerson Parcel. This would probably act as a substantial refuge for Swainson's hawk in the long term, but there would still be a loss of about 700 acres of suitable foraging habitat. The availability of nearby offsite wildlife refuge habitat is constrained by cumulative impacts of residential development surrounding most of the project site.

Many of the large trees on the Dutch Slough site occur in areas that would be inundated by tidal waters. Once dead, these trees would no longer provide nesting habitat for Swainson's hawks. This is a potentially significant impact.

"NO BURROUGHS" OPTION

The Burroughs parcel contains the majority of the large trees suitable for raptor nesting within the project area. In 2008, the only Swainson's hawk nest within the project site was located on the Burroughs parcel. In addition, approximately 300 acres on this parcel are managed as irrigated pasture, which provides foraging habitat for Swainson's hawks. Thus, exercising this option would result in a significant reduction in impacts to both foraging and nesting Swainson's hawks.

MITIGATION 3.4.1-8.1: MITIGATION FOR LOSS OF SWAINSON'S HAWK FORAGING AND NESTING HABITAT.

DWR shall acquire and protect off-site mitigation lands through one (or more) of the following methods:

- acquire and permanently protect lands

- purchase conservation easements to permanently protect lands
- participation in an in-lieu fee program
- purchase of the required acreage in an approved mitigation bank
- participation in an approved Habitat Conservation Plan.

Such mitigation lands should be near the project site and contain stands of mature trees with irrigated pasture, ruderal seasonal wetland, or alfalfa hay crop cover. For maximum benefit to Swainson's hawks, the first priority would be for alfalfa or irrigated and mowed pasture.

The acreage of protected habitat shall be established in consultation with DFG and based on the following:

- number of Swainson's hawks using the project site for nesting and foraging as determined by annual bird surveys to be begun in 2008,
- ecological assessment of the acreage of habitats used by Swainson's hawk and the quality of those habitats for Swainson's hawk, and
- use of Swainson's hawk as an "umbrella" species for other sensitive species occupying terrestrial pasture/ruderal wildlife habitat at Dutch Slough.

To the extent feasible, the conservation easement or other acquisition of habitat shall be implemented before commencement of grading in irrigated pasture on the project site.

If habitat is acquired and preserved, a Mitigation and Monitoring Plan describing the mitigation and monitoring requirements and performance standards shall be prepared and submitted to DFG for approval within six months of acquisition.

In addition, implementation of mitigation measures 3.4.1-1.1, 3.4.1-1.2, and 3.4.1-11 would minimize impacts to Swainson's hawks. To the extent feasible, the levee breaches will be constructed after local Swainson's hawks have fledged their young, and possibly after birds have migrated south for the winter. This would prevent abrupt disruptions to local resident birds.

If final project designs preserve sufficient upland habitat on the project site, these lands, to the extent compatible with the restoration, will be managed as Swainson's hawk foraging habitat.

MITIGATION 3.4.1-8.2: AVOID AND MINIMIZE LOSS OF SWAINSON'S HAWK NESTING TREES.

Annual surveys shall be conducted starting in 2008 to identify trees on the Dutch Slough site that are used by Swainson's hawks. To the extent feasible, regularly used nesting trees will be protected from long- and short-term project impacts. In addition, implement Mitigation Measure 3.4.1-7.

IMPACT SIGNIFICANCE AFTER MITIGATION

If sufficient quality and quantity of off-site compensatory mitigation habitats are acquired in appropriate geographic settings, impacts would be less than significant.

IMPACT 3.4.1-9: POTENTIAL IMPACTS TO BURROWING OWLS (DUTCH SLOUGH RESTORATION PROJECT WITH ALL OPEN WATER MANAGEMENT OPTIONS AND BOTH RELATED PROJECTS)

Avian surveys conducted by DWR in 2005 and 2008 did not detect burrowing owls on site, though there is suitable habitat, and the species had been previously reported from the site. Suitable habitat for burrowing owls in pasture, levee, and ruderal vegetation with ground squirrel burrows would be inundated by tidal restoration. This habitat loss would add cumulatively to the losses of occupied burrowing owl habitat in adjacent former ranch parcels converted to residential developments. These would be significant direct and cumulative impacts to burrowing owl habitat if these owls were to occur on the site.

Recent surveys of adjacent ranches with similar pasture habitat indicated that they are often present in low numbers (several per ranch parcel), but may be concentrated in sandy soils with high densities of mammal burrows. Restored lowland grassland (closed perennial vegetation cover) may be less suitable grassland habitat for burrowing owls than disturbed, semi-open arid ruderal pasture and revegetated ditch banks of the existing cattle pastures.

“NO BURROUGHS” OPTION

Although recent surveys have not found burrowing owls on the Burroughs parcel, suitable habitat does exist there. Exercising the “no Burroughs” option, preserving it as upland habitat, would preserve potential habitat for the owls. If owls were found on the other Dutch Slough parcels, and moving the owls was deemed appropriate by USFWS and DFG, artificial burrows could be created for them on the Burroughs parcel.

MITIGATION 3.4.1-9 MINIMIZE AND COMPENSATE FOR POTENTIAL IMPACTS TO BURROWING OWLS

Annual surveys will be conducted starting in 2008 to determine foraging and nesting status, and population size. Surveys shall comply with standard protocol survey methods approved by DFG. In addition, surveys will be conducted within 30 days of commencement of earth-moving activities, or other construction activities, such as placement of fill. Pre-construction surveys must be repeated if more than 30 days pass between survey dates and construction activities.

Presence or sign of burrowing owl and all potentially occupied burrows will be recorded and monitored according to DFG guidelines. If burrowing owls are not detected by sign or direct observation, construction may proceed. If burrowing owls are present during surveys conducted between February 1 and August 31, grading will not be allowed within 250 feet of any burrow, unless approved by DFG.

A compensatory mitigation plan shall be prepared and implemented if burrowing owls are confirmed to occur on site. Compensatory mitigation shall comply with guidelines accepted by DFG. Mitigation may include placement of exclusion doors on occupied burrows (passive relocation), establishment of artificial burrows on or near the project site, or monitoring of burrows.

If burrowing owls are detected on the project site, foraging habitat with natural or artificial burrows will be acquired and permanently protected to compensate for the habitat loss. The protected lands shall be occupied burrowing owl habitat, or created habitat, in an area acceptable to DFG. First priority would be to preserve habitat on the project site; second priority would be to off-site loca-

tions near (within approximately a 5 mile radius of) the project site; third priority would be to off-site location further from the project site that is acceptable to DFG. Habitat will be acquired, permanently protected, and enhanced through management, for the benefit of the burrowing owl. If lands are purchased and managed, a Mitigation and Monitoring Plan describing the mitigation and monitoring requirements and performance standards will be prepared. Alternatively, the required mitigation can be met by purchase of credits in an accepted mitigation bank, in-lieu fee program, or approved Habitat Conservation Plan

If acceptable to DFG, Mitigation 3.4.1-8.1 (purchase of off-site mitigation area primarily for Swainson's hawk) may also be applied to this impact to compensate for significant loss of suitable habitat because the degree to which restored grasslands on the project site (which, under the influence of higher groundwater elevations adjacent to restored tidal marsh, may naturally develop lowland grassland characteristics less suited to burrowing owl) compensate for habitat losses is doubtful.

IMPACT SIGNIFICANCE AFTER MITIGATION

If burrowing owls are found on the project site, potentially significant impacts may persist after mitigation, because the feasibility of mitigation is unknown (particularly the availability of off-site compensatory habitat).

IMPACT 3.4.1-10: POTENTIAL IMPACTS TO WHITE-TAILED KITE AND NORTHERN HARRIER (DUTCH SLOUGH RESTORATION PROJECT WITH ALL OPEN WATER MANAGEMENT OPTIONS AND BOTH RELATED PROJECTS)

Construction and habitat conversion would abruptly eliminate existing available foraging habitat and impact nesting habitat on site. These would be significant impacts. The three Dutch Slough Restoration Project "build" alternatives would not differ substantially in their significant short-term impacts to these species. Alternative 1 would include more suitable terrestrial foraging habitat and nesting habitat in the long term, but less wetland foraging habitat. All project "build" alternatives would significantly reduce potential nesting sites for white-tailed kites in mature trees. The open water management option for subsidence reversal (nontidal tule marsh) would reduce net loss of high-value foraging habitat for white-tail kites and northern harriers compared with deepwater or skeletal marsh/channel options.

"NO BURROUGHS" OPTION

The Burroughs parcel contains the majority of the large trees suitable for white-tailed kite nesting within the project area. In addition, the majority of the terrestrial and wetland habitat (approximately 350 acres) on the Burroughs parcel provides foraging habitat for white-tailed kites and foraging or nesting habitats for northern harriers. Thus, exercising this option would result in a significant reduction in impacts to both foraging and nesting habitats for these species.

MITIGATION 3.4.1-10: MITIGATION FOR POTENTIAL IMPACTS TO WHITE-TAILED KITE AND NORTHERN HARRIER

Implementation of Mitigation 3.4.1-1.1, 3.4.1-1.2, and 3.4.1-11 would minimize impacts to these raptor species. If off site mitigation lands are acquired as per Mitigation 3.4.1-8.1, these lands would also mitigate for impacts to white-tailed kites and northern harriers.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation, because white-tailed kites and northern harriers can utilize marsh as well as grassland habitat for foraging.

IMPACT 3.4.1-11: POTENTIAL IMPACTS TO NESTING BIRDS (DUTCH SLOUGH RESTORATION PROJECT AND RELATED PROJECTS AND ALL OPEN WATER MANAGEMENT OPTIONS)

Several special status and common bird species have the potential to nest throughout the project area. Annual bird surveys will be conducted, beginning in 2008, which will document nesting by special status species. All areas except open water are potential nest sites including all vegetation types and structures. Removal of buildings or trees, grading or earth moving, and introduction of tidal action have the potential to result in nest abandonment, nest failure, or premature fledging of young. Destruction or disturbance of active nests would be a violation of the Migratory Bird Treaty Act and DFG Code, and would be considered a potentially significant or significant impact, depending on the level of disturbance and the species disturbed.

“NO BURROUGHS” OPTION

Exercising the “no Burroughs” option would protect all the existing bird nesting sites on that parcel. The parcel contains a number of suitable nesting sites including large trees, buildings, riparian woodland, terrestrial pasture and ruderal habitat, and freshwater marsh.

MITIGATION 3.4.1-11: MITIGATION FOR POTENTIAL IMPACTS TO NESTING BIRDS

Earth moving activities and removal of buildings or trees shall occur from September 1 through February 28, outside the normal nesting season. If earth moving must occur during the nesting season, vegetation shall be removed from September 1 to February 28, to discourage nesting in the construction area. If removal of structures, trees or other vegetation, or construction begins between March 1 and August 31, a nesting bird survey shall be performed by a qualified biologist within 14 days prior to the disturbance. The biologist shall inspect for nests in all potential habitats (trees, shrubs, structures, grasslands, pastures, emergent wetland vegetation, etc.) in and immediately adjacent to the impact area, as well as watch for adult birds displaying reproductive behaviors such as carrying nest materials or food items.

If active nests are found, appropriate non-disturbance buffer zones shall be established around the nest site. The size of the buffer zone will be determined by a qualified biologist in consultation with DFG, and will depend upon the species involved, site conditions, and type of work to be conducted in the area.

Active nests shall be monitored by a qualified biologist to determine when young have fledged and are no longer using the nest site. The biologist and DFG shall determine when construction activities may resume in the buffer zone.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.1-12 POTENTIAL IMPACTS TO TRICOLORED BLACKBIRDS (DUTCH SLOUGH RESTORATION PROJECT WITH ALL OPEN WATER MANAGEMENT OPTIONS AND BOTH RELATED PROJECTS)

Dutch Slough Restoration Project construction activities and tidal habitat conversion would eliminate suitable foraging habitat of tricolored blackbird, primarily in seasonal wetland within grazed irrigated pastures. Although the restored tidal marsh may provide nesting habitat for the species, long-term restoration of tidal marsh and terrestrial grassland would not compensate for loss. This would be a potentially significant short-term and long-term impact. This impact would be cumulatively significant because of widespread conversion of similar extensive habitat to residential development in all adjacent ranches. Annual bird surveys will be conducted, beginning in 2008, which will assess use of the site by tricolored blackbirds.

“NO BURROUGHS” OPTION

Exercising the “no Burroughs” option would protect approximately 350 acres of potential foraging habitat for the tricolored blackbirds, decreasing impacts to the species.

MITIGATION 3.4.1-12: MITIGATION FOR POTENTIAL IMPACTS TO TRICOLOR BLACKBIRDS

If off-site mitigation lands are acquired as per Mitigation 3.4.1-8.1, they would mitigate for loss of foraging habitat for tricolored blackbirds. If final project designs maintain significant acreage of terrestrial habitat, this would reduce impacts to tricolored blackbirds. Increases in acreage of tidal marsh may provide nesting habitat for the species in the long term.

IMPACT SIGNIFICANCE AFTER MITIGATION

If sufficient quality and quantity of off-site compensatory mitigation habitats are acquired in appropriate geographic settings, impacts would be less than significant.

IMPACT 3.4.1-13: POTENTIAL IMPACTS TO CALIFORNIA HORNED LARKS (DUTCH SLOUGH RESTORATION PROJECT WITH OPEN WATER MANAGEMENT OPTIONS AND BOTH RELATED PROJECTS)

Construction and tidal restoration activities would destroy most suitable habitat for California horned larks (irrigated and arid pastures) in the short-term. This would be a potentially significant impact. Annual bird surveys will be conducted, beginning in 2008, which will assess use of the site by horned larks.

“NO BURROUGHS” OPTION

Exercising the “no Burroughs” option would protect approximately 350 acres of potential foraging and nesting habitat for horned larks, decreasing impacts to the species.

MITIGATION 3.4.1-13: MITIGATION FOR POTENTIAL IMPACTS TO CALIFORNIA HORNED LARKS

If off-site mitigation lands are acquired as per Mitigation 3.4.1-8.1 this impact would be mitigated. If final project designs maintain significant acreage of terrestrial habitat, this would reduce impacts to

horned larks. In addition, implementation of Mitigation Measures 3.4.1-1.1, 3.4.1-1.2, and 3.4.1-11 would minimize impacts to horned larks.

IMPACT SIGNIFICANCE AFTER MITIGATION

Provision of adequate off-site or on-site mitigation acreage including interspersions of seasonal wetlands in irrigated pasture would reduce this impact to less than significant. The Dutch Slough and Ironhouse restorations themselves would not compensate for the seasonal wetland habitat/grassland mosaic in irrigated pastures.

IMPACT 3.4.1-14: POTENTIAL IMPACTS TO LOGGERHEAD SHRIKES (DUTCH SLOUGH RESTORATION PROJECT WITH OPEN WATER MANAGEMENT OPTIONS AND BOTH RELATED PROJECTS)

Construction and tidal restoration activities would eliminate most suitable foraging habitat for loggerhead shrikes (irrigated and arid pastures, scrub) in the short- and long-term. This would be a potentially significant impact. Annual bird surveys will be conducted, beginning in 2008, which will assess use of the site by loggerhead shrikes and quantify the level of impact.

“NO BURROUGHS” OPTION

Exercising the “no Burroughs” option would protect approximately 350 acres of potential foraging habitat for loggerhead shrikes, decreasing impacts to the species.

MITIGATION 3.4.1-14: POTENTIAL IMPACTS TO LOGGERHEAD SHRIKES

If off-site mitigation lands are acquired as per Mitigation 3.4.1-8.1 this impact would be mitigated. If final project designs maintain significant acreage of terrestrial habitat, this would reduce impacts to loggerhead shrikes.

IMPACT SIGNIFICANCE AFTER MITIGATION

Provision of adequate off-site or on-site mitigation acreage including interspersions of seasonal wetlands in irrigated pasture would reduce this impact to less than significant. The Dutch Slough and Ironhouse restorations themselves would not compensate for the seasonal wetland habitat/grassland mosaic in irrigated pastures.

IMPACT 3.4.1-15: POTENTIAL IMPACTS TO YELLOW-BREASTED CHATS AND OTHER MARSH AND RIPARIAN SONGBIRDS (DUTCH SLOUGH RESTORATION PROJECT WITH ALL OPEN WATER MANAGEMENT OPTIONS)

Yellow-breasted chats may be exposed to short-term adverse impacts of habitat destruction during project construction. Short-term losses of existing freshwater marsh/riparian habitat edges on site would reduce or eliminate habitat for the species. This could be a significant short-term impact. In the long-term, the project would increase habitat for the species.

“NO BURROUGHS” OPTION

Exercising the “no Burroughs” option would protect existing freshwater marsh and riparian habitat for chats and other songbirds, decreasing the short-term impacts to these species.

MITIGATION 3.4.1-15: MITIGATION FOR POTENTIAL IMPACTS TO YELLOW-BREASTED CHATS AND OTHER SONGBIRDS

Mitigation 3.4.1-3 applies to this impact. Annual bird surveys will be conducted, beginning in 2008, which will assess use of the site by yellow-breasted chats and other special status marsh songbirds. If those surveys have documented nesting by any special status marsh songbirds prior to construction, applicants shall conduct additional surveys for yellow-breasted chats and avoid disturbance of high-use habitats during the nesting season. This would reduce impacts to chats and other riparian songbirds to less than significant levels.

In addition, implementation of Mitigation measure 3.4.1-1.1 would minimize impacts to yellow-breasted chats.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.1-16: POTENTIAL IMPACTS TO SPECIAL-STATUS WADING BIRDS (DUTCH SLOUGH RESTORATION PROJECT)

Because snowy egrets and white-faced ibis would be able to forage in recently flooded, disturbed wetlands with shallow water and fish, their foraging habitat use would not be adversely affected by project construction activities or interim nontidal water management. However, there would be short-term habitat loss in the period between site grading and inundation. In addition, some potential roosting habitat for egrets would be lost due to elimination of existing nontidal riparian woodland (especially decadent old stands) near foraging habitats. Because there is no evidence of site-faithful or location-specific egret roosts, this would not be a significant impact. Egrets would probably benefit from long-term tidal marsh restoration with adjacent riparian woodland, mostly in channel edges. No mitigation is indicated for foraging habitat.

OPEN WATER MANAGEMENT OPTIONS

Managed marsh (subsidence reversal) during early phases of succession is likely to provide the greatest benefits of all options. Skeletal marsh/channel could also provide substantial benefits, depending on steepness of marsh berms.

MITIGATION 3.4.1-16: MITIGATION FOR SPECIAL-STATUS WADING BIRDS

Because the restoration would increase marsh habitats, wading birds are expected to benefit from the project (mitigation 3.4.1-2.1). Mitigation 3.4.1-1.2 includes large woody debris that will provide riparian roosting habitat in the interim before restored riparian woodland develops mature or decadent roosting or nesting structures, also applies to this impact.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.1-17: POTENTIAL IMPACTS TO CALIFORNIA BLACK RAIL (DUTCH SLOUGH RESTORATION PROJECT WITH OPEN WATER MANAGEMENT OPTIONS AND IRONHOUSE PROJECTS)

Dredging of fringing tidal marshes along Little Dutch Slough to increase tidal prism/flow conveyance could disturb California black rails, destroy potential nests, and destroy suitable habitat. The project as a whole would likely have long-term beneficial effects on the region's California black rail population.

“NO BURROUGHS” OPTION

If the “no Burroughs” option were exercised, dredging of Little Dutch Slough would not occur, so there would be no associated impacts to black rails or their habitat.

MITIGATION 3.4.1-17: MITIGATION FOR POTENTIAL IMPACTS TO CALIFORNIA BLACK RAIL

Annual bird surveys will be conducted, beginning in 2008, which will assess use of the site by black rails. If those surveys have documented presence of black rails, DWR shall conduct pre-construction surveys for rails in potential dredging or construction sites in or adjacent to fringing tidal marshes. If California black rails are detected within 500 feet of proposed dredging or construction sites, DWR shall consult with DFG to modify construction timing and location to minimize or avoid impacts.

In addition, Mitigations 3.4.1-2.1, 3.4.1-2.2, and 3.4.1-2.3 also would apply to this impact.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.1-18: POTENTIAL IMPACTS TO CALIFORNIA TIGER SALAMANDERS (DUTCH SLOUGH RESTORATION PROJECT WITH OPEN WATER MANAGEMENT OPTIONS AND BOTH RELATED PROJECTS)

If undetected relict populations of California tiger salamander occur within suitable habitat (alkali meadow, seasonal pools near ground squirrel burrows in terrestrial habitat) at the project site, they would be eliminated by Dutch Slough Restoration Project construction and tidal restoration. This would be a significant impact. The probability of this impact is very unlikely, but unknown because of a lack of survey information.

“NO BURROUGHS” OPTION

Exercising the “no Burroughs” option would protect approximately 350 acres of potential habitat for tiger salamanders, decreasing potential impacts to the species.

MITIGATION 3.4.1-18: MITIGATION FOR POTENTIAL IMPACTS TO CALIFORNIA TIGER SALAMANDERS

DWR, through the federal lead permit agency, shall conduct early informal consultation with the USFWS to determine whether or how surveys for the California tiger salamander shall be performed in suitable pools at the Dutch Slough project site. Avoidance of impacts to local populations and habitats would be infeasible because of the subsided (below sea level) position of existing potential

habitats. If California tiger salamanders are detected on site, DWR shall consult with USFWS and DFG. Three possible mitigation strategies may be applicable: (a) construction of suitable alternative seasonal wetland habitat within the overall wetland restoration project, followed by translocation of captured tiger salamander adults to receptive, suitable habitat; (b) off-site protection and enhancement of existing, established tiger salamander populations; or (c) a combination of (b) and (c). Otherwise, impacts would be significant and unmitigated in the unlikely event that populations do occur on site. Any plans to construct surrogate habitat and translocate California tiger salamanders shall be coordinated and approved by USFWS and DFG.

IMPACT SIGNIFICANCE AFTER MITIGATION

It is unlikely that the species is present on the project site, so there is very low probability of any impact. However, if the species were present on the site, off-site mitigation would be required to reduce impacts to less than significant.

IMPACT 3.4.1-19 POTENTIAL IMPACTS TO CALIFORNIA RED-LEGGED FROGS (DUTCH SLOUGH RESTORATION PROJECT AND ALL OPEN WATER MANAGEMENT OPTIONS)

Dutch Slough Restoration Project construction, water management, and tidal restoration would eliminate suitable, relatively isolated patches of freshwater marsh habitats that are potentially suitable for the California red-legged frog. Surveys of nearby areas have not found any red-legged frogs, and dispersal corridors from remote off-site populations to the site's isolated patches of suitable habitat are densely populated with bullfrogs (heavy predation "sink"), so the on-site habitat patches are unlikely to be occupied by California red-legged frogs. If, however, small (low probability of detection), isolated, remnant populations of California red-legged persist on the site, they would probably suffer local extirpation as a result of project construction. No California red-legged frogs have been detected on the Dutch Slough Restoration Project site in general amphibian and reptile surveys, so this potential significant impact is unlikely to occur.

"NO BURROUGHS" OPTION

Exercising the "no Burroughs" option would protect ditches and freshwater marsh on the parcel which could serve as potential habitat for red-legged frogs, decreasing impacts to the species.

MITIGATION 3.4.1-19: MITIGATION FOR POTENTIAL IMPACTS TO CALIFORNIA RED-LEGGED FROGS

DWR, through the federal lead permit agency, shall conduct early informal consultation with USFWS to determine whether or how surveys for the California red-legged frog shall be performed at the Dutch Slough project site. If this species is detected, develop and incorporate habitat restoration and relocation plans for any populations detected at the Dutch Slough project site, in context of formal consultation with the USFWS. Suitable restored habitats to mitigate losses of occupied on-site habitats may include relatively isolated depressional freshwater marshes and ponds near the landward edge of the restored tidal marsh. These shall be in areas where seasonal evaporation (drawdown, concentration of brackish salinity (2-3 ppt) to moist soil in late summer may restrict the life-cycle of predatory non-native bullfrogs (tadpoles normally requiring maturation in continuously flooded nonsaline habitats 2 years), and facilitate maintenance of relatively viable, persistent local California red-legged frog populations.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.1-20: POTENTIAL IMPACTS TO NORTHWESTERN POND TURTLES (DUTCH SLOUGH RESTORATION PROJECT WITH OPEN WATER MANAGEMENT OPTIONS AND RELATED PROJECTS)

Occupied on-site habitats and populations of northwestern pond turtles would be directly impacted by earth moving and tidal marsh restoration. Existing habitats below sea level would be submerged by restored tides, which would increase aquatic habitat but would probably reduce basking and nesting habitats. If fill or borrow sites are selected in occupied habitats, individuals may be destroyed directly by earthmoving activities.

The Dutch Slough and related Ironhouse restoration projects may, in the long-term, provide a net gain of suitable habitat in restored tidal freshwater marshes. However, this potential benefit would depend on the availability of specific, essential sub-habitats, including well-distributed basking sites, nesting habitat, flood escape habitat, and backwater ponds relatively free from predatory fish and bullfrogs. These specialized structural features of tidal marsh are not currently included in project designs, and they are unlikely to develop spontaneously in immature, early-succession freshwater tidal marsh during periods of accelerated sea level rise.

The presence of a small (<2 year old) pond turtle in 2005 established that there is successful pond turtle breeding on or near the project site. Because the actual nesting area is unknown, nesting habitat on the Dutch Slough or Ironhouse sites could be lost when the area is restored to tidal action. If there is nesting habitat on the City Park site, it will also be negatively affected by development of the park. Loss of nesting habitat would be a significant impact.

“NO BURROUGHS” OPTION

Pond turtles are regularly seen in water bodies on the Burroughs parcel. These habitats would remain undisturbed if the Burroughs parcel were not restored to tidal action; this would significantly reduce impacts to the species.

MITIGATION 3.4.1-20: MITIGATION FOR POTENTIAL IMPACTS TO NORTHWESTERN POND TURTLES

Apply Mitigation measures 3.4.1-2.1-3. A detailed habitat assessment of the Dutch Slough and City Park project sites shall be done by a qualified biologist to determine locations of potential nesting habitat, and how tidal action may affect those areas. USFWS and DFG will be consulted to determine optimal timing of the levee breaches to minimize the potential inundation of turtle nests (also considering effects on other special-status species). In addition, earth-moving activities of the project shall be phased to protect existing western pond turtle habitats and populations at least until suitable replacement freshwater marsh and shallow open water habitats have been restored on-site. DWR shall consult with the USFWS and DFG to determine the need for active translocation of northwestern pond turtles from existing marsh/pond habitats to constructed suitable pond turtle habitats. The amount, type, and location of large woody debris suitable as cover and basking habitat for northwestern pond turtle shall be modified to enhance habitat value for northwestern pond turtles along constructed tidal sloughs. In consultation with DFG and USFWS, nesting habitat features may be incorporated into the final Dutch Slough project design.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.1-21: POTENTIAL IMPACTS TO GIANT GARTER SNAKES (DUTCH SLOUGH RESTORATION PROJECT AND BOTH RELATED PROJECTS)

A detailed habitat assessment of the Dutch Slough project site was completed in 2005. The assessment concluded that although there was potential habitat, it was unlikely to be occupied by giant garter snakes based on the land use, quality and quantity of habitat, and absence of a nearby population. In addition, based on recent, rigorous, area-wide focused surveys including Marsh Creek and the Contra Costa Canal, it is highly unlikely that the Dutch Slough, Ironhouse, or City Park sites are occupied by giant garter snakes. Therefore, the projects are not expected to impact the species. If undetected populations of giant garter snakes were present in suitable existing habitats on site (particularly Emerson Parcel), however, construction and restoration impacts of tidal conversion would probably cause mortality of individual garter snakes, or extirpation of the local population. Existing suitable giant garter snake habitat would be eliminated. The long-term freshwater tidal marsh restoration of the project site is likely to increase habitat availability and quality, but realization of this habitat area and volume would depend on potential colonization from nearby source populations, rare long-distance dispersal events, or recovery-related translocation actions approved by the USFWS.

OPEN WATER MANAGEMENT OPTIONS

Skeletal marsh/creek designs may provide additional habitat for Giant Garter Snake if channel banks include topographic high areas supporting high marsh, riparian thickets, and large woody debris. Subsidence reversal option may also provide marginal additional habitat.

“NO BURROUGHS” OPTION

Exercising the “no Burroughs” option would protect ditches, freshwater marsh, and potential basking habitats on the parcel, decreasing potential impacts to giant garter snakes.

MITIGATION 3.4.1-21: MITIGATION FOR POTENTIAL IMPACTS TO GIANT GARTER SNAKES

On-site mitigation measures for impacts to northwestern pond turtles (Mitigation 3.4.1-20) as well as Mitigation 3.4.1-2.1-3 would substantially mitigate significant impacts to any extant on-site giant garter snake population, if it exists. In addition, DWR shall:

- Conduct early informal consultation with the USFWS to determine whether or how surveys for the giant garter snake shall be performed in suitable, relatively isolated freshwater marsh habitat patches at the Dutch Slough project site.
- Perform pre-construction surveys for giant garter snakes if required by USFWS.
- If this species is detected, develop and incorporate habitat restoration and relocation plans for any populations detected, in context of formal consultation with the USFWS.

IMPACT SIGNIFICANCE AFTER MITIGATION.

Less than significant with mitigation.

IMPACT 3.4.1-22: POTENTIAL IMPACTS TO SILVERY LEGLESS LIZARD (DUTCH SLOUGH RESTORATION PROJECT WITH ALL OPEN WATER MANAGEMENT OPTIONS AND CITY PARK)

Silvery legless lizards have the potential to inhabit areas of sandy soils which are present on all three parcels of the Dutch Slough project, and the City Park property. All these areas are moderately to heavily disturbed by development and human activities (City Park Property), agriculture (vineyard on Emerson parcel), or grazing (all other areas of the Dutch Slough project) which make it unlikely that legless lizards occupy the project site. Some of the sandy soil areas on the Emerson and Gilbert parcel are likely to remain uninundated by the tidal restoration.

MITIGATION 3.4.1-22: MITIGATION FOR POTENTIAL IMPACTS TO SILVERY LEGLESS LIZARD

Because potential habitat on the Dutch Slough site is highly disturbed and therefore unlikely to be occupied by the silvery legless lizard, and because the species is difficult to detect, surveys for the species are not proposed. To mitigate for potential impacts, the restoration plan will include habitat improvements to the sandy areas that will remain uninundated after tidal restoration to benefit silvery legless lizard, as well as other special-status dune species. Species experts, USFWS, and DFG will be consulted on details for habitat improvements.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.1-23: POTENTIAL IMPACTS TO VERNAL POOL FAIRY SHRIMP AND OTHER SPECIAL STATUS VERNAL POOL INVERTEBRATES (DUTCH SLOUGH RESTORATION PROJECT AND OPEN WATER MANAGEMENT OPTIONS)

Habitat assessments and surveys for vernal pool fairy shrimp and branchiopods at adjacent ranches south of Dutch Slough and east of the project site have had generally negative survey results; most of these areas have had low to moderate potential suitable habitat for insects, and some suitable habitat for branchiopods. These conditions are similar at Dutch Slough; given the disturbance from grazing and agriculture, and the preponderance of nonnative annual grasses, there is little habitat for special status invertebrates.

DWR conducted a habitat assessment for vernal pool branchiopods on March 18, 2008. A number of areas were found that were considered to be potential habitat, though the likelihood of branchiopod presence was considered low due to the lack of standing water during the assessment, the preponderance of non-clay soils at the site, and information from long-time resident Brent Gilbert who reported that there are few areas that hold water longer than a week or two during the winter. Because most potentially suitable habitats are likely to be degraded by irrigation, cattle, and dominance of nonnative species, populations would probably be low in conservation importance if they did occur. If undetected populations of vernal pool invertebrate species occurred on-site, however, they would be eliminated by construction and restoration activities. This would be a potentially significant impact.

“NO BURROUGHS” OPTION

Exercising the “no Burroughs” option would protect any existing ponds, ditches, or seasonal wetlands on the Burroughs parcel that may provide habitat to vernal pool invertebrates. This would decrease potential impacts to these species.

MITIGATION 3.4.1-23: MITIGATION FOR POTENTIAL IMPACTS TO VERNAL POOL FAIRY SHRIMP AND OTHER SPECIAL-STATUS VERNAL POOL INVERTEBRATES

A qualified biologist shall conduct wet season surveys on the Dutch Slough project site for vernal pool invertebrates for one winter survey period according to USFWS protocol. If special-status species are not found during the wet season survey and it is deemed necessary by the qualified biologist to continue surveys, one additional wet season survey will be conducted. If special-status species are not detected after completion of the second survey, no further mitigation will be required.

If any special-status branchiopod is detected, suitable replacement habitat (with proper hydroperiod and depth) should be constructed at a 2:1 ratio on appropriate soils on-site. The habitat shall be permanently protected, enhanced, and managed for the benefit of the species. Original areas occupied by special-status vernal pool species shall be excavated in such a way to preserve the uppermost layer of soil, which may contain cysts of special-status species and seeds of native plants. This soil shall be placed in newly-created habitat as inoculum. A Mitigation and Monitoring plan describing the habitat replacement/translocation plan, mitigation and monitoring requirements, and performance standards shall be prepared if habitat is developed for special status vernal pool species. This Plan will be reviewed for approval by the UFWS and DFG.

If it is deemed infeasible to create habitat on-site, habitat will be replaced, created, or preserved at a location approved by USFWS. The habitat in the amount specified by USFWS shall be acquired, permanently protected, and enhanced for the benefit of the species. Alternatively, DWR may provide the required acreage in an approved mitigation bank or Habitat Conservation Plan.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.1-24: POTENTIAL IMPACTS TO VALLEY ELDERBERRY LONGHORN BEETLE (DUTCH SLOUGH RESTORATION PROJECT AND CITY PARK)

At least two elderberry shrubs are present on the project sites. One of these is near the boundary of the Dutch Slough project and the City Park, but its exact location relative to the line between the properties has not yet been established. However, it is likely that both shrubs will be impacted by the projects, leading to potential impacts to the beetle.

MITIGATION 3.4.1-24: MITIGATION FOR POTENTIAL IMPACTS TO VALLEY ELDERBERRY LONGHORN BEETLE

A stem count and measurement of the two elderberry shrubs will be conducted 60 days prior to construction activity that would disturb the plants. Based on number and size of stems, USFWS guidelines for replacement and mitigation will be followed. If feasible, the shrubs will be salvaged and planted elsewhere on the Dutch Slough project site. Additional elderberry shrubs, as deter-

mined by USFWS guidelines will also be planted on-site, or possibly at an off-site mitigation area or bank approved by USFWS.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.1-25: POTENTIAL IMPACTS TO HERITAGE OR OTHER TREES PROTECTED BY LOCAL ORDINANCE (DUTCH SLOUGH RESTORATION PROJECT AND CITY PARK)

A number of trees within the project areas for the Dutch Slough project and the City Park would be removed directly or killed by tidal inundation. Some of these may qualify as Heritage or Protected Trees under the City of Oakley Tree Ordinance.

“NO BURROUGHS” OPTION

The majority of the large trees on the project site are located on the Burroughs parcel. Thus, exercising this option would result in a significant reduction in impacts to protected trees.

MITIGATION 3.4.1-25: MITIGATION FOR POTENTIAL IMPACTS TO PROTECTED TREES

Once design plans for the Dutch Slough Restoration and the City Park are finalized, an assessment will be made to determine which trees will be removed or killed by the projects. A certified arborist will be hired to examine the trees and determine whether they are protected by the tree ordinance. All protected trees will be mitigated for as outlined in the ordinance.

DWR WILL CONSULT WITH THE CITY OF OAKLEY WHEN DETERMINING THE NUMBER AND SPECIES OF TREES TO BE PLANTED ON THE DUTCH SLOUGH PROJECT SITE.IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

CUMULATIVE IMPACTS

CUMULATIVE IMPACTS TO TERRESTRIAL AND WETLAND BIOLOGICAL RESOURCES

The alternatives' contributions to potential significant cumulative impacts to wetland and terrestrial biological resources are summarized below. They are evaluated in detail above under the Alternative 1 impact analysis.

- Cumulative reduction in the amount and quality of foraging habitat (open grassland-like habitats) utilized by special status birds, including Swainson's hawk, burrowing owls, California horned lark, and loggerhead shrike.
- Cumulative reductions to the population size and viability of special-status birds dependent on pasture and ruderal habitat (open grassland-like habitats) utilized by special status birds, including Swainson's hawk, burrowing owls, California horned lark, and loggerhead shrike.
- Cumulative reductions of the amount of seasonal wetland habitat associated with alkali meadow and similar habitats similar to playa, alkali grassland, or alkali vernal pools.

- Cumulative loss of steep peat banks fringing tidal marshes, generally caused by boat wakes, but also by channel dredging and rock slope armor.
- Cumulative loss of successful western pond turtle breeding habitat.
- Cumulative reductions in the stability and persistence of established clonal populations of Suisun aster.

IMPACT SIGNIFICANCE AFTER MITIGATION

Cumulative impacts to wildlife dependent on terrestrial biological resources are due in part to recent and planned residential development throughout these habitats between Marsh Creek and Sand Mound Slough, leaving the last large block of this habitat mix at the project site. This cumulative wildlife habitat loss affects Swainson's hawk, burrowing owls, California horned lark, and loggerhead shrike. If onsite mitigation for cumulative impacts to special-status and sensitive species is inadequate, the project's impacts to wildlife would be mitigated by providing compensating offsite mitigation. This would reduce the project's contribution to cumulative impacts to these species to a less than significant level.

Other cumulative impacts are likely to be fully mitigated by a combination of on-site mitigation measures to minimize, avoid, or rectify individual project impacts, and limited off-site mitigation. Burrowing owl impacts may also fall in this category, depending on the offsite mitigation approach applied (extensive grassland protection versus Contra Costa Canal bank enhancement). Construction and management of specific, local seasonal wetlands types at adjacent Iron-house parcels may mitigate cumulative impacts to species dependent on this habitat type, but the availability of these lands is also uncertain.

ECOLOGICAL CONSEQUENCES OF ACCELERATED SEA LEVEL RISE

The ecological consequences of accelerated sea level rise are a concern for all tidal marsh restoration projects. At low rates of sea level rise, such as those that have prevailed in the last 3,000 years, freshwater tidal marshes generally kept pace with rising sea level by compensatory increases in marsh primary production (organic peat accumulation), or both. Modern freshwater tidal marsh succession may proceed from low intertidal marsh to high intertidal marsh through the same processes. In contrast, when sea level rises at rates that exceed the ability of tule marshes to keep pace with marsh peat accretion, marshes gradually "drown" – upper tidal marsh zones may submerge and convert to low marsh, and lower marsh zones may be converted to shallow open water or SAV (submerged aquatic vegetation) beds. Tidal marsh drowning has already occurred in the United States in some coastal regions with locally accelerated sea level rise due to subsidence, and it is expected to occur in the future (Reed and Cahoon 1992; Reed 1995; Morris et al. 2002; Overpeck et al. 2006).

The ecological expression of accelerated sea level rise in approaching decades at the Dutch Slough Restoration Project may include: (a) more gradual than expected colonization of low marsh at the lower intertidal zone; with prolonged persistence of mudflats; (b) "drowning" or submergence of lower tule marsh, and conversion to SAV or channel habitat; (c) delayed or arrested emergence of upper intertidal freshwater marsh with high species diversity; (d) compression of tidal marsh zonation along steeper slopes of levees. Some of these effects of sea level rise may be subject to adaptive management actions, such as artificial construction of localized high marsh on artificial fill. Other impacts related to systemic sediment deficits or submergence due to sea level rise may be less readily compensated.

Alternative 2: Moderate Fill

IMPACT 3.4.2-1.1: POTENTIAL IMPACTS TO IRRIGATED PASTURES (INCLUDING JURISDICTIONAL SEASONAL WETLANDS) AND RUDERAL TERRESTRIAL HABITATS AND ASSOCIATED WILDLIFE SPECIES (ALL OPTIONS)

Alternative 2 retains substantially less terrestrial habitat within the project site than Alternative 1. Alternative 2 also distributes terrestrial habitat in narrower borders, like buffer zones, and in low islands within the restored tidal marsh. These terrestrial edge habitats are likely to provide more habitat value for resident marsh wildlife, but would provide relatively lower habitat value (per acre) for principally terrestrial wildlife associated with large, continuous blocks of terrestrial habitat, especially foraging raptors. Alternative 2 would have stronger significant impacts to terrestrial wildlife compared with Alternatives 1 and 4 (No Project). It would not differ significantly from Alternative 3 in this respect.

MITIGATION 3.4.2-1.1: AVOID AND MINIMIZE EFFECTS OF LOSS OF IRRIGATED PASTURE AND RUDERAL HABITATS THROUGH PROJECT TIMING AND PHASING.

Same as Alternative 1, but greater impacts would result from Alternative 2 because less terrestrial habitat would be retained and restored. The quality of retained and restored terrestrial habitat would probably differ from existing conditions and Alternative 1 because a higher proportion of terrestrial habitats would occur at the edge of tidal marsh, and would be affected by high groundwater. This would promote more closed, perennial grassland and scrub vegetation. Therefore, more off-site mitigation would be required.

IMPACT SIGNIFICANCE AFTER MITIGATION

If sufficient quality and quantity of off-site compensatory mitigation habitats are acquired in appropriate geographic settings, impact would be less than significant.

MITIGATION 3.4.2-1.2 & 3.4.2-1.3: MITIGATE FOR AND MINIMIZE EFFECTS OF (.2) RECREATION, AND (.3) EFFECTS OF CITY PARK LIGHTING.

Both Mitigation Measures will be the same as for Alternative 1.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant.

IMPACT 3.4.2-2.1: POTENTIAL IMPACTS TO TIDAL FRESHWATER MARSH HABITATS AND ASSOCIATED WILDLIFE SPECIES (DUTCH SLOUGH RESTORATION PROJECT AND RELATED PROJECTS)

The impacts to wildlife in existing freshwater tidal marsh habitats are the same as Alternative 1, but the degree to which the restoration projects “self-mitigate” by providing an increase in habitat acreage may differ in Alternative 2. Alternative 2 would provide a more favorable balance of low to middle tidal freshwater marsh to buffer risks of marsh submergence due to sea-level rise, or poor restored habitat quality, compared with Alternatives 1 and 3. It distributes fill such that high and low marsh form gradients in each parcel, and develop transition zones with riparian woodland/scrub or terrestrial grassland throughout. It performs better at “self-mitigation” for loss of complex gradients and mosaics of freshwater marsh habitats on the Dutch Slough site than other alternatives.

OPEN WATER MANAGEMENT OPTIONS

Subsidence reversal (managed nontidal marsh) would generate the greatest amount of nontidal freshwater marsh with similar wildlife habitat value as tidal freshwater marsh for most affected wildlife species, and would contribute most to “self-mitigation” for the loss of existing freshwater tidal marsh in terms of raw freshwater marsh acreage. Maximizing productivity of tules for subsidence reversal, however, may not maximize all wildlife habitat or wildlife populations that require a mix of shallow open water interspersed with variable vegetation and a range of food plants and cover types; wildlife diversity/habitat diversity and marsh productivity are not likely to be positively correlated. Managed pond and deepwater options would also generate at least a fringe of freshwater marsh habitat. Skeletal marsh management would provide some linear freshwater marsh along intertidal berms within open water areas, and edges of open water would also support a freshwater marsh fringe. Managed pond, deepwater, and skeletal marsh/tidal channels would generate less marsh area, but potentially more marsh/shallow water edge habitat favorable for marsh wildlife diversity. All open water management options would provide some mitigation for impacts to nontidal freshwater marsh, and subsidence reversal (managed tule marsh) would likely produce the most “self-mitigation”, followed by skeletal marsh/tidal channels.

MARSH CREEK DELTA RELOCATION OPTIONS

Marsh Creek Delta relocation options would be likely to increase overall structural diversity of tidal marsh habitats (increasing complexity of habitat patterns, gradients, and diversity of microhabitats).

“NO BURROUGHS” OPTION

If the “no Burroughs” option were exercised, the project would ultimately result in significantly fewer acres of tidal marsh habitat. This may significantly reduce the benefits of the project by decreasing habitat acreage for fishes and other aquatic organisms as well as ecosystem benefits such as primary productivity.

MITIGATION 3.4.2-2.1: MITIGATION FOR POTENTIAL IMPACTS TO WILDLIFE IN TIDAL FRESHWATER MARSH

All three Mitigation Measures are the same as for Alternative 1.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.2-3 POTENTIAL IMPACTS TO NONTIDAL FRESHWATER MARSH AND RIPARIAN WOODLAND/SCRUB AND ASSOCIATED WILDLIFE SPECIES (DUTCH SLOUGH RESTORATION PROJECT AND RELATED PROJECTS)

The impacts to wildlife in existing nontidal freshwater tidal marsh habitats are the same as Alternative 1, but the degree to which the Dutch Slough project supplies its own mitigation by compensatory mitigation (“self-mitigation”) may differ in Alternative 2. Many wildlife habitat functions supplied by nontidal freshwater marsh may in the long term be replaced by mature tidal freshwater marsh. Isolation of marsh ponds from nonnative predatory fish and bullfrogs, however, may not be replaced by tidal marsh. Alternative 2 would provide a more favorable balance of low to middle tidal freshwater marsh to buffer risks of marsh submergence due to sea-level rise, or poor restored habitat quality, compared with Alternatives 1 and 3. It distributes fill such that high and low marsh

form gradients in each parcel, and develop transition zones with riparian woodland/scrub or terrestrial grassland throughout. It performs better at “self-mitigation” for loss of complex gradients and mosaics of freshwater marsh habitats on the Dutch Slough project site than other alternatives. In this respect, it is similar or somewhat better compared with Alternative 3, which has more total marsh area, but less well integrated sub-habitat structure (marsh gradients, interspersions of upland, high marsh, middle marsh, low marsh and riparian woodland/thicket).

OPEN WATER MANAGEMENT OPTIONS

Subsidence reversal (managed nontidal marsh) would generate the greatest amount of nontidal freshwater marsh, and would contribute most to “self-mitigation” for the loss of existing freshwater tidal marsh in terms of raw acreage. Maximizing productivity of tules for subsidence reversal, however, may not maximize all wildlife habitat or wildlife populations that require a mix of shallow open water interspersed with variable vegetation and a range of food plants and cover types; wildlife diversity and marsh productivity are not likely to be positively correlated. Managed pond and deepwater options would also generate at least a fringe of freshwater marsh habitat. Skeletal marsh management would provide some linear freshwater marsh along intertidal berms within open water areas, and edges of open water would also support a freshwater marsh fringe. Managed pond, deepwater, and skeletal marsh/tidal channels would generate less marsh area, but potentially more marsh/shallow water edge habitat favorable for marsh wildlife diversity. All open water management options would provide some mitigation for impacts to nontidal freshwater marsh, and subsidence reversal (managed tule marsh) would likely produce the most “self-mitigation”, followed by skeletal marsh/tidal channels.

MARSH CREEK DELTA RELOCATION OPTIONS

Each of the Marsh Creek diversion options would be likely to increase the interspersions of riparian, marsh, and channel/open water habitats, and may contribute substantially to compensating for losses to equivalent existing habitats. The individual options cannot be predicted to differ significantly in this mitigative aspect of marsh/riparian/open water interspersions or edge habitat.

Flood sediment deposition from Marsh Creek in the restored marsh, however, may cause either beneficial marsh habitat or adverse impacts, depending on final design. Peak flood transport of coarse sediment (sands, silts) in Marsh Creek may potentially deliver potentially valuable or disruptive delta-like sediment fans to the Emerson Parcel, depending on the location and interaction with restored marsh. If large, coarse, immobile sediment deposits form in areas of low-energy tidal channels, they may obstruct marsh and channel drainage, form large undrained channel pools, cause significant mosquito production, and provide deepwater stagnant pond habitats favorable for non-native bullfrogs. These would be significant indirect impacts of specific final Marsh Creek design in relation to restored tidal marsh and channels. If sediment fans or deltas form in open water (forming prograding marsh) or over low marsh plains lacking channels (forming natural high marsh gradients), they would instead contribute valuable dynamic freshwater marsh habitat. These potential benefits or impacts would be controlled by design options for the point of diversion and the structure of receiving waters or marsh. Similar potential benefits or impacts could occur for Ironhouse overflow channel design options. These potentially significant adverse impacts could occur in each of the Marsh Creek Delta restoration options because all of them would direct coarse bedload of flood flows into channelized tidal marsh. Option 3 has the greatest potential to dam or choke tidal flows to the greatest length of channel and marsh.

MITIGATION 3.4.2-3: DESIGN RESTORATION PLANS TO MINIMIZE IMPACTS TO NONTIDAL FRESHWATER MARSH AND RIPARIAN WOODLAND/SCRUB AND ASSOCIATED WILDLIFE SPECIES

Same as Alternative 1, with the following addition for Marsh Creek diversion impacts on freshwater marsh habitat quality:

“In final design, locate Marsh Creek mouth diversion points over low marsh or channels where its flood deposits are unlikely to obstruct terminal slough channels.”

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.2-4: POTENTIAL IMPACTS TO ALKALI MEADOW AND SEASONAL WETLAND FLATS AND ASSOCIATED WILDLIFE SPECIES (ALL OPTIONS)

Same as Alternative 1.

MITIGATION 3.4.2-4: RECREATE HABITAT FEATURES TO REDUCE POTENTIAL IMPACTS TO WILDLIFE OF ALKALI MEADOW AND SEASONAL WETLAND FLATS

Same as Alternative 1.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.2-5: POTENTIAL IMPACTS TO SPECIAL-STATUS PLANTS

Basically the same as Alternative 1, except for the following contrasts related to Marsh Creek diversion impacts and the extent and quality of terrestrial habitat. Each option of Marsh Creek Delta restoration designs may directly impact or destroy existing colonies of special-status tidal marsh plants, or additional colonies that may establish near them by the time of construction. Alternative 2 includes substantially less potential terrestrial grassland area that could serve as remaining habitat for terrestrial special-status plants (Congdon's tarplant, big tarweed), and more of this habitat would likely be unsuitable because a higher proportion would be at the edge of tidal marsh, likely to be dominated by sod-forming perennial grasses incompatible with regeneration of this annual species.

MITIGATION 3.4.2-5: MITIGATION FOR POTENTIAL IMPACTS TO SPECIAL-STATUS PLANTS (ALL OPTIONS)

Both Mitigation Measures are the same as for Alternative 1.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.2-6: POTENTIAL IMPACTS TO SPECIAL-STATUS BAT SPECIES (ALL OPTIONS)

Same as Alternative 1.

MITIGATION 3.4.2-6: MINIMIZATION AND COMPENSATION FOR POTENTIAL IMPACTS TO SPECIAL-STATUS BAT SPECIES

Same as Alternative 1.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.2-7: POTENTIAL IMPACTS TO COOPER'S HAWK (ALL OPTIONS)

Similar to Alternative 1. Because significantly less terrestrial habitat will be retained in Alternative 2 compared with Alternative 1, and more of it will consist of narrow strips of lowland edge habitat, there are greater impacts than in Alternative 1, that require additional tree planting or protection of off-site groves of mature trees.

MITIGATION 3.4.2-7: MITIGATION FOR POTENTIAL IMPACTS TO COOPER'S HAWK

Short-term impacts cannot be mitigated because existing tree habitats lie mostly below sea level. Long-term impacts may be mitigated by riparian woodland restoration and enhancement design of the Dutch Slough Restoration Project. Addition of some native coast live oak woodland groves, and individual oaks, to terrestrial habitat restoration should be included because they would substantially contribute to efficacy of mitigation. Retain mature trees in the new park, including decadent trees.

IMPACT SIGNIFICANCE AFTER MITIGATION

If sufficient quality and quantity of off-site compensatory mitigation habitats are acquired in appropriate geographic settings, impacts would be less than significant.

IMPACT 3.4.2-8: IMPACTS TO SWAINSON'S HAWK (ALL OPTIONS)

Alternative 2 would retain significantly less acreage of terrestrial habitat suitable as foraging habitat for Swainson's hawk compared with Alternative 1, and would maintain it as a narrow strip at the southern end of all Dutch Slough Restoration Project parcels. This would not act as a substantial refuge for Swainson's hawk in the long term, and would be even less adequate at minimizing the loss of over 800 acres of suitable foraging habitat than Alternative 1. This Alternative would therefore require more acreage as off-site mitigation. However, the availability of offsite wildlife refuge habitat is constrained by cumulative impacts of residential development surrounding the Dutch Slough area.

There would also be more nesting trees lost in Alternative 2, due to the larger acreage of created wetlands.

MITIGATION 3.4.2-8: MITIGATION FOR IMPACTS TO SWAINSON'S HAWK

Both Mitigation measures would be the same as in Alternative 1, but more acreage and more trees would be needed to compensate for the larger losses.

IMPACT SIGNIFICANCE AFTER MITIGATION

If sufficient quality and quantity of off-site compensatory mitigation habitats are acquired in appropriate geographic settings, impacts would be less than significant.

IMPACT 3.4.2-9: POTENTIAL IMPACTS TO BURROWING OWLS (ALL OPTIONS)

Direct, indirect, and cumulative impacts would be the same as Alternative 1, but Alternative 2 would potentially impact more acreage. The quality of retained terrestrial habitat for burrowing owls would be reduced because it would occur as a narrow strip at the southern end of all Dutch Slough Restoration Project parcels with a high proportion of it near the tidal marsh edge. This would favor dominance by sod-forming perennial grasses that would reduce or eliminate nesting habitat. The availability of offsite wildlife refuge habitat is constrained by cumulative impacts of residential development surrounding most of the Dutch Slough site.

MITIGATION 3.4.2-9: MITIGATION FOR POTENTIAL IMPACTS TO BURROWING OWLS

Same as Alternative 1.

IMPACT SIGNIFICANCE AFTER MITIGATION

Potentially significant impacts after mitigation.

IMPACT 3.4.2-10: POTENTIAL IMPACTS TO WHITE-TAIL KITE AND NORTHERN HARRIER (ALL OPTIONS)

Same as Alternative 1.

MITIGATION 3.4.2-10: MITIGATION FOR POTENTIAL IMPACTS TO WHITE-TAIL KITE AND NORTHERN HARRIER

Same as Alternative 1.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.2-11: POTENTIAL IMPACTS TO NESTING BIRDS (ALL OPTIONS)

Same as Alternative 1.

MITIGATION 3.4.2-11: MITIGATION FOR POTENTIAL IMPACTS TO NESTING BIRDS

Same as Alternative 1.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.2-12: POTENTIAL IMPACTS TO TRICOLOR BLACKBIRDS (ALL OPTIONS)

Same as Alternative 1.

MITIGATION 3.4.2-12: MITIGATION FOR POTENTIAL IMPACTS TO TRICOLOR BLACKBIRDS

Same as Alternative 1.

IMPACT SIGNIFICANCE AFTER MITIGATION

If sufficient quality and quantity of off-site compensatory mitigation habitats are acquired in appropriate geographic settings, impacts would be less than significant.

IMPACT 3.4.2-13: POTENTIAL IMPACTS TO CALIFORNIA HORNED LARKS (ALL OPTIONS)

Same as Alternative 1.

MITIGATION 3.4.2-13: MITIGATION FOR POTENTIAL IMPACTS TO CALIFORNIA HORNED LARKS

Same as Alternative 1.

IMPACT SIGNIFICANCE AFTER MITIGATION

If sufficient quality and quantity of off-site compensatory mitigation habitats are acquired in appropriate geographic settings, impacts would be less than significant.

IMPACT 3.4.2-14: POTENTIAL IMPACTS TO LOGGERHEAD SHRIKES (ALL OPTIONS)

Same as Alternative 1.

MITIGATION 3.4.2-14: MITIGATION FOR POTENTIAL IMPACTS TO LOGGERHEAD SHRIKES

Same as Alternative 1.

IMPACT SIGNIFICANCE AFTER MITIGATION

If sufficient quality and quantity of off-site compensatory mitigation habitats are acquired in appropriate geographic settings, impacts would be less than significant.

IMPACT 3.4.2-15: POTENTIAL IMPACTS TO YELLOW-BREASTED CHATS AND OTHER SONGBIRDS OF MARSH AND RIPARIAN HABITATS (ALL OPTIONS)

Same as Alternative 1.

MITIGATION 3.4.1-15: MITIGATION FOR POTENTIAL IMPACTS TO YELLOW-BREASTED CHATS AND OTHER SONGBIRDS OF MARSH AND RIPARIAN HABITATS

Same as Alternative 1.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.2-16: POTENTIAL IMPACTS TO SPECIAL-STATUS WADING BIRDS (ALL OPTIONS)

Same as Alternative 1.

MITIGATION 3.4.2-16: MITIGATION FOR POTENTIAL IMPACTS TO SPECIAL STATUS WADING BIRDS

Same as Alternative 1.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.2-17: POTENTIAL IMPACTS TO CALIFORNIA BLACK RAIL (ALL OPTIONS)

Same as Alternative 1.

MITIGATION 3.4.2-17: MITIGATION FOR POTENTIAL IMPACTS TO CALIFORNIA BLACK RAIL

Same as Alternative 1.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.2-18: POTENTIAL IMPACTS TO CALIFORNIA TIGER SALAMANDERS (ALL OPTIONS)

Same as Alternative 1.

MITIGATION 3.4.2-18: MITIGATION FOR POTENTIAL IMPACTS TO CALIFORNIA TIGER SALAMANDERS

Consultation with USFWS and possible survey components of mitigation are the same as Alternative 1, but compensatory components of mitigation (b, c) would probably be infeasible with Alternative 2 because there is insufficient space within terrestrial habitats to construct viable seasonal wetland habitat in suitable locations, and with sufficient defensible buffering against bullfrog dispersal. Offsite mitigation would be necessary if California tiger salamanders are detected on site, but this is highly unlikely.

IMPACT SIGNIFICANCE AFTER MITIGATION

It is unlikely that the species is present on the project site, so there is very low probability of any impact. However, if the species were present on the site, off-site mitigation would be required to reduce impacts to less than significant.

IMPACT 3.4.2-19: POTENTIAL IMPACTS TO CALIFORNIA RED-LEGGED FROGS (ALL OPTIONS)

Same as Alternative 1.

MITIGATION 3.4.2-19: MITIGATION FOR POTENTIAL IMPACTS TO CALIFORNIA RED-LEGGED FROGS

Same as Alternative 1.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.2-20: POTENTIAL IMPACTS TO NORTHWESTERN POND TURTLES (ALL OPTIONS)

Similar to Alternative 1 except for Marsh Creek realignment effects, below.

DUTCH SLOUGH RESTORATION PROJECT AND RELATED PROJECTS AND OPEN WATER MANAGEMENT OPTIONS

Managed marsh (subsidence reversal) during early phases of succession is likely to provide the greatest benefits of all options. Skeletal marsh/channel could also provide substantial benefits, depending on steepness of marsh berms.

MARSH CREEK DELTA RELOCATION OPTIONS

Marsh Creek mouth realignment would cause construction impacts that would be likely to disturb resident turtle populations and temporarily remove suitable or occupied habitat. This would be a significant impact. Specific options may differ from one another with respect to this impact, depending on the specific location of turtle basking sites that cannot be foreseen (because channel maintenance may alter their local distribution by the time impacts occur). Conversely, if Marsh Creek flood sediments choked or cut off pre-existing tidal sloughs, converting some to elongate relict channel ponds, Marsh Creek realignment may increase potential turtle habitat.

MITIGATION 3.4.2-20: MITIGATION FOR POTENTIAL IMPACTS TO NORTHWEST POND TURTLES

Same as Alternative 1.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.2-21: POTENTIAL IMPACTS TO GIANT GARTER SNAKES (ALL OPTIONS)

Same as Alternative 1.

MITIGATION 3.4.2-21: MITIGATION FOR POTENTIAL IMPACTS TO GIANT GARTER SNAKES

Same as Alternative 1.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.2-22: POTENTIAL IMPACTS TO SILVERY LEGLESS LIZARD (DUTCH SLOUGH RESTORATION PROJECT AND OPEN WATER MANAGEMENT OPTIONS)

Same as Alternative 1.

MITIGATION 3.4.2-22: MITIGATION FOR POTENTIAL IMPACTS TO SILVERY LEGLESS LIZARD

Same as Alternative 1.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.2-23: POTENTIAL IMPACTS TO VERNAL POOL INVERTEBRATES (ALL OPTIONS)

Same as Alternative 1.

MITIGATION 3.4.2-23: MITIGATION FOR POTENTIAL IMPACTS TO VERNAL POOL INVERTEBRATES

Consultation with USFWS and possible survey components of mitigation are the same as Alternative 1, but compensatory components of mitigation (b, c) for special-status branchiopods in seasonal wetland pools may be constrained in Alternative 2, because there probably is insufficient space within terrestrial habitats to construct viable shallow seasonal wetland habitat in suitable locations. Offsite mitigation may be necessary if special-status branchiopods are detected on site, which is highly unlikely. Habitat restoration for special-status insects native to sandy, arid, loose substrates would probably be highly feasible, but feasibility of translocation or temporary refuge methods may be uncertain.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.2-24: POTENTIAL IMPACTS TO VALLEY ELDERBERRY LONGHORN BEETLE

Same as Alternative 1.

MITIGATION 3.4.2-24: MITIGATION FOR POTENTIAL IMPACTS TO VALLEY ELDERBERRY LONGHORN BEETLE

Same as Alternative 1.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.2-25: POTENTIAL IMPACTS TO HERITAGE OR OTHER TREES PROTECTED BY LOCAL ORDINANCE (DUTCH SLOUGH RESTORATION PROJECT AND CITY PARK)

Same as Alternative 1.

MITIGATION 3.4.2-25: MITIGATION FOR POTENTIAL IMPACTS TO PROTECTED TREES

Same as Alternative 1.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

Alternative 3: Maximum Fill

IMPACT 3.4.3-1.1: IMPACTS TO WILDLIFE FROM LOSS OF IRRIGATED PASTURE AND RUDERAL HABITATS AS A RESULT OF DUTCH SLOUGH, CITY PARK, AND IRONHOUSE PROJECTS

Alternative 3 retains substantially less terrestrial habitat within the Dutch Slough Restoration Project site than Alternative 1. Alternative 3 also distributes terrestrial habitat in narrower borders, like buffer zones, and in low islands within the restored tidal marsh. These terrestrial edge habitats are likely to provide more habitat value for resident marsh wildlife, but would provide relatively lower habitat value (per acre) for principally terrestrial wildlife associated with large, continuous blocks of terrestrial habitat, especially foraging raptors. Alternative 3 would have stronger significant impacts to terrestrial wildlife compared with Alternatives 1 and 4. It would not differ significantly from Alternative 2 in this respect.

MITIGATION 3.4.3-1.1: AVOID AND MINIMIZE EFFECTS OF LOSS OF IRRIGATED PASTURE AND RUDERAL HABITATS THROUGH PROJECT TIMING AND PHASING

Same as Alternative 1.

IMPACT SIGNIFICANCE AFTER MITIGATION

If sufficient quality and quantity of off-site compensatory mitigation habitats are acquired in appropriate geographic settings, impacts would be less than significant.

IMPACT 3.4.3-1.2: WILDLIFE DISTURBANCE (DIRECT AND INDIRECT) ON TERRESTRIAL HABITATS ASSOCIATED WITH RECREATION AS A RESULT OF DUTCH SLOUGH AND CITY PARK PROJECTS

MITIGATION 3.4.1-1.2: HABITAT ENHANCEMENT TO OFFSET HABITAT LOSS AND DISTURBANCE ON TERRESTRIAL HABITATS ASSOCIATED WITH RECREATION

Same as proposed project. It should be noted that under this alternative, less on-site upland acreage would be available for restoration, and off-site mitigation proposed under Mitigation 3.4.3-1.1 also may be required to mitigate this impact.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.3-2.1: POTENTIAL IMPACTS TO TIDAL FRESHWATER MARSH HABITATS AND ASSOCIATED WILDLIFE SPECIES (DUTCH SLOUGH RESTORATION PROJECT AND RELATED PROJECTS)

The impacts to wildlife in existing freshwater tidal marsh habitats would be the same as Alternative 1 and 2, but the degree to which Alternative 3 alternative is self-mitigating may differ. Alternative 3 would provide a less favorable balance of low to middle tidal freshwater marsh to buffer risks of marsh submergence due to sea-level rise, or poor restored habitat quality, compared with Alternatives 2. It distributes fill such that high and low marsh are segregated in Gilbert and Burroughs par-

cels, rather than joined in natural gradients. The entire low marsh in Burroughs would be at greater risk of complete submergence by accelerated sea level rise, and conversion to excessive or predominant open water habitat.

OPEN WATER MANAGEMENT OPTIONS

Subsidence reversal in Emerson parcel, the only open water management in Alternative 3, would make the entire Dutch Slough Restoration Project's wetland component freshwater marsh and riparian habitat, and would most completely mitigate impacts to tidal marsh in the long-term.

MARSH CREEK DELTA RELOCATION OPTIONS

Same as Alternative 2.

MITIGATION 3.4.3-2.1: MITIGATION FOR POTENTIAL IMPACTS TO TIDAL FRESHWATER MARSH HABITATS AND ASSOCIATED WILDLIFE SPECIES

Same as Alternative 2.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.3-2.2: WILDLIFE DISTURBANCE (DIRECT AND INDIRECT) AROUND THE MARSH EDGE ASSOCIATED WITH RECREATION AS A RESULT OF DUTCH SLOUGH AND CITY PARK PROJECTS

MITIGATION 3.4.3-2.2: HABITAT ENHANCEMENT TO OFFSET HABITAT LOSS AND DISTURBANCE AROUND THE MARSH EDGE ASSOCIATED WITH RECREATION.

- Same as Alternative 2.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.3-3 POTENTIAL IMPACTS TO FRESHWATER MARSH HABITATS AND ASSOCIATED WILDLIFE SPECIES (DUTCH SLOUGH RESTORATION PROJECT AND RELATED PROJECTS)

Alternative 3 proposes greater wetland foundation fill that could potentially support marsh gradients well-buffered against excessive sea level rise or subsidence. Alternative 3 distributes fill very unevenly, however, between Burroughs and Gilbert parcels, rather than establish balanced marsh gradients (high marsh to low) over each parcel. This design favors experimental objectives segregating "treatments" of different marsh plain elevations, with priority over freshwater marsh habitat structure and value for all wildlife in all restored parcels. It reduces the extent of consolidated blocks of marsh gradients that would promote persistent favorable wildlife habitat structure during potential accelerated sea level rise. This alternative, therefore, has less ecological resilience than Alternative 2, and less favorable wildlife habitat structure for all restored parcels. The nontidal freshwater wetlands on the site, in contrast, include interspersed, well-distributed adjacent zones of riparian woodland/scrub, freshwater marsh, and open water. The degree to which Alternative 3 "self-mitigates"

impacts to wetland-dependent wildlife that rely on integration structure of multiple freshwater wetland habitats is less than Alternative 2.

Other impacts to nontidal marsh would be the same as Alternatives 1 and 2.

OPEN WATER MANAGEMENT OPTION

In Alternative 3, open water management applies only to the Emerson Parcel; the other parcels would be entirely channelized tidal marsh. Subsidence reversal (managed nontidal marsh) would generate the greatest amount of nontidal freshwater marsh, and would contribute most to “self-mitigation” for the loss of existing freshwater tidal marsh in terms of raw acreage. Maximizing productivity of tules for subsidence reversal, however, may not maximize all wildlife habitat or wildlife populations that require a mix of shallow open water interspersed with variable vegetation and a range of food plants and cover types; wildlife diversity and marsh productivity are not likely to be positively correlated. Managed pond and deepwater options would also generate at least a fringe of freshwater marsh habitat. Skeletal marsh management would provide some linear freshwater marsh along intertidal berms within open water areas, and edges of open water would also support a freshwater marsh fringe. Managed pond, deepwater, and skeletal marsh/tidal channels would generate less marsh area, but potentially more marsh/shallow water edge habitat favorable for marsh wildlife diversity. All open water management options would provide some mitigation for impacts to nontidal freshwater marsh, and subsidence reversal would likely produce the most “self-mitigation”, followed by skeletal marsh/tidal channels.

MARSH CREEK DELTA RELOCATION OPTIONS

Marsh Creek Delta relocation options would probably not differ in their contribution to “self-mitigation” for impacts to nontidal freshwater marsh in Alternative 3.

MITIGATION 3.4.3-3: MITIGATION FOR POTENTIAL IMPACTS TO NONTIDAL FRESHWATER MARSH HABITATS AND ASSOCIATED WILDLIFE SPECIES

Same as Alternative 2.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.3-4: POTENTIAL IMPACTS TO ALKALI MEADOW AND SEASONAL WETLAND FLATS (ALL OPTIONS) AND ASSOCIATED WILDLIFE SPECIES

Same as Alternatives 1 and 2.

MITIGATION 3.4.3-4: MITIGATION FOR POTENTIAL IMPACTS TO ALKALI MEADOW AND SEASONAL WETLAND FLATS AND ASSOCIATED WILDLIFE SPECIES

Same as Alternatives 1 and 2.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.3-5: POTENTIAL IMPACTS TO SPECIAL-STATUS PLANTS (ALL OPTIONS)

Same as Alternatives 2.

MITIGATION 3.4-3.5: MITIGATION FOR POTENTIAL IMPACTS TO SPECIAL-STATUS PLANTS

Same as Alternative 2

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.3-6: POTENTIAL IMPACTS TO SPECIAL-STATUS BAT SPECIES (ALL OPTIONS)

Same as Alternatives 1 and 2.

MITIGATION 3.4.3-6: MITIGATION FOR POTENTIAL IMPACTS TO SPECIAL-STATUS BAT SPECIES

Same as Alternatives 1 and 2.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.3-7: POTENTIAL IMPACTS TO COOPER'S HAWK (ALL OPTIONS)

Same as Alternative 2.

MITIGATION 3.4.3-7: MITIGATION FOR POTENTIAL IMPACTS TO COOPER'S HAWK

Same as Alternative 2.

IMPACT 3.4.3-8: IMPACTS TO SWAINSON'S HAWK

Same as Alternative 2.

MITIGATION 3.4.3-8: MITIGATION FOR IMPACTS TO SWAINSON'S HAWK (ALL OPTIONS)

Both Mitigation measures would be the same as in Alternative 2, but more acreage and more trees would be needed to compensate for the larger losses.

IMPACT SIGNIFICANCE AFTER MITIGATION

If sufficient quality and quantity of off-site compensatory mitigation habitats are acquired in appropriate geographic settings, impacts would be less than significant.

IMPACT 3.4.3-9: POTENTIAL IMPACTS TO BURROWING OWLS (ALL OPTIONS)

Same as Alternative 2.

MITIGATION 3.4.3-9: MITIGATION FOR POTENTIAL IMPACTS TO BURROWING OWLS

Same as Alternative 2.

IMPACT SIGNIFICANCE AFTER MITIGATION

Potentially significant impacts after mitigation.

**IMPACT 3.4-3.10: POTENTIAL IMPACTS TO WHITE-TAIL KITE AND NORTHERN HARRIER
(ALL OPTIONS)**

Same as Alternative 2 for white tailed kite.

Similar to Alternatives 1 and 2 for northern harrier. However, Alternative 3 would probably be superior in compensating for long-term conversion impacts to northern harriers because it would provide for the largest marsh foraging area and the highest marsh (most suitable for foraging).

**MITIGATION 3.4.3-10: MITIGATION FOR POTENTIAL IMPACTS TO WHITE-TAIL KITE
AND NORTHERN HARRIER**

Same as Alternative 2 for white tailed kite and same as Alternatives 1 and 2 for northern harrier.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.3-11: POTENTIAL IMPACTS TO NESTING BIRDS (ALL OPTIONS)

MITIGATION 3.4.3-11: MITIGATION FOR POTENTIAL IMPACTS TO NESTING BIRDS

Same as Alternatives 1 and 2.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation, because northern harrier can utilize marsh as well as grassland habitat for foraging.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.3-12: POTENTIAL IMPACTS TO TRICOLOR BLACKBIRDS (ALL OPTIONS)

Same as Alternatives 1 and 2.

**MITIGATION 3.4.3-12: MITIGATION FOR POTENTIAL IMPACTS TO TRICOLOR
BLACKBIRDS**

Same as Alternatives 1 and 2.

IMPACT SIGNIFICANCE AFTER MITIGATION

If sufficient quality and quantity of off-site compensatory mitigation habitats are acquired in appropriate geographic settings, impacts would be less than significant.

IMPACT 3.4.3-13: POTENTIAL IMPACTS TO CALIFORNIA HORNED LARKS (ALL OPTIONS)

Same as Alternatives 1 and 2.

MITIGATION 3.4.3-13: MITIGATION FOR POTENTIAL IMPACTS TO CALIFORNIA HORNED LARKS

Same as Alternatives 1 and 2.

IMPACT SIGNIFICANCE AFTER MITIGATION

If sufficient quality and quantity of off-site compensatory mitigation habitats are acquired in appropriate geographic settings, impacts would be less than significant.

IMPACT 3.4.3-14: POTENTIAL IMPACTS TO LOGGERHEAD SHRIKES (ALL OPTIONS)

Same as Alternatives 1 and 2.

MITIGATION 3.4.3-14: MITIGATION FOR POTENTIAL IMPACTS TO LOGGERHEAD SHRIKES

Same as Alternatives 1 and 2.

IMPACT SIGNIFICANCE AFTER MITIGATION

If sufficient quality and quantity of off-site compensatory mitigation habitats are acquired in appropriate geographic settings, impacts would be less than significant.

IMPACT 3.4.3-15: POTENTIAL IMPACTS TO YELLOW-BREASTED CHATS AND OTHER SONGBIRDS OF MARSH AND RIPARIAN HABITATS (ALL OPTIONS)

Same as Alternatives 1 and 2.

MITIGATION 3.4.3-15: MITIGATION FOR POTENTIAL IMPACTS TO YELLOW-BREASTED CHATS AND OTHER SONGBIRDS OF MARSH AND RIPARIAN HABITATS

Same as Alternatives 1 and 2.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.3-16: POTENTIAL IMPACTS TO SPECIAL-STATUS WADING BIRDS (ALL OPTIONS)

Same as Alternatives 1 and 2.

MITIGATION 3.4.3-16: MITIGATION FOR POTENTIAL IMPACTS TO SPECIAL STATUS WADING BIRDS

Same as Alternatives 1 and 2.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.3-17: POTENTIAL IMPACTS TO CALIFORNIA BLACK RAIL (ALL OPTIONS)

Same as Alternative 2, but Alternative 3 could establish more potential habitat for California black rail, depending on whether constructed channel banks include high to middle marsh habitat. Otherwise, Alternative 2, though providing less overall high/middle marsh, provides more interspersed high marsh, terrestrial edge habitat near channels, where black rails are most likely to establish home ranges.

MITIGATION 3.4.3-17: MITIGATION FOR POTENTIAL IMPACTS TO CALIFORNIA BLACK RAIL

Same as Alternative 2. Alternative 3 has potential for more “self-mitigation” than Alternative 2 because it includes larger areas of high/middle marsh zones.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.3-18 POTENTIAL IMPACTS TO CALIFORNIA TIGER SALAMANDERS (ALL OPTIONS)

Same as Alternatives 1 and 2.

MITIGATION 3.4.3-18: MITIGATION FOR POTENTIAL IMPACTS TO CALIFORNIA TIGER SALAMANDERS

Same as Alternative 2.

IMPACT SIGNIFICANCE AFTER MITIGATION

It is unlikely that the species is present on the project site, so there is very low probability of any impact. However, if the species were present on the site, off-site mitigation would be required to reduce impacts to less than significant.

IMPACT 3.4.3-19: POTENTIAL IMPACTS TO CALIFORNIA RED-LEGGED FROGS (ALL OPTIONS)

Same as Alternatives 1 and 2.

MITIGATION 3.4.3-19: MITIGATION FOR POTENTIAL IMPACTS TO CALIFORNIA RED-LEGGED FROGS

Same as Alternatives 1 and 2.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.3-20: POTENTIAL IMPACTS TO NORTHWEST POND TURTLES (ALL OPTIONS)

Same as Alternative 1.

MITIGATION 3.4.3-20: MITIGATION FOR POTENTIAL IMPACTS TO NORTHWEST POND TURTLES

Same as Alternative 1.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.3-21: POTENTIAL IMPACTS TO GIANT GARTER SNAKES (ALL OPTIONS)

Same as Alternative 2.

MITIGATION 3.4.3-21: MITIGATION FOR POTENTIAL IMPACTS TO GIANT GARTER SNAKES

Same as Alternative 2.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.3-22: POTENTIAL IMPACTS TO SILVERY LEGLESS LIZARD (ALL OPTIONS)

Same as Alternative 2.

MITIGATION 3.4.3-22: MITIGATION FOR POTENTIAL IMPACTS TO SILVERY LEGLESS LIZARD

Same as Alternative 2.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.3-23: POTENTIAL IMPACTS TO VERNAL POOL INVERTEBRATES (ALL OPTIONS)

Same as Alternatives 1 and 2.

MITIGATION 3.4.3-23: MITIGATION FOR POTENTIAL IMPACTS TO VERNAL POOL INVERTEBRATES

Same as Alternative 1.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.3-24: POTENTIAL IMPACTS TO VALLEY ELDERBERRY LONGHORN BEETLE

Same as Alternative 1.

MITIGATION 3.4.3-24: MITIGATION FOR POTENTIAL IMPACTS TO VALLEY ELDERBERRY LONGHORN BEETLE

Same as Alternative 1.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

IMPACT 3.4.3-25: POTENTIAL IMPACTS TO HERITAGE OR OTHER TREES PROTECTED BY LOCAL ORDINANCE (DUTCH SLOUGH RESTORATION PROJECT AND CITY PARK)

Same as Alternative 1.

MITIGATION 3.4.3-25: MITIGATION FOR POTENTIAL IMPACTS TO PROTECTED TREES

Same as Alternative 1.

IMPACT SIGNIFICANCE AFTER MITIGATION

Less than significant with mitigation.

Alternative 4: No Project**IMPACT 3.4.4-1: LONG-TERM EFFECTS ON EXISTING TERRESTRIAL AND WETLAND WILDLIFE HABITATS**

The existing conditions that are used as an environmental baseline for assessment of biological impacts are a static “snapshot” of dynamic, long-term ecological conditions of the Dutch Slough area. The “no project” alternative, by definition, causes no immediate impacts in relation to itself. However, it should be noted that long-term degradation of the habitat on the site may occur absent any restoration activities

Catastrophic levee breaching or flooding from overtopping would remain an infrequent but high impact, and an inherent risk for existing non-tidal diked wetland habitats of the Dutch Slough site. Levee breaching or flooding from overtopping would largely eliminate resident terrestrial wildlife populations (burrowing mammals, terrestrial predators, lizards, terrestrial invertebrates), and cause significant declines (mass mortality) in amphibians and semi-aquatic reptiles (turtles, snakes, frogs). The intensity of severe flooding would depend on the season, duration and depth of flooding. As surrounding areas suffer declines in terrestrial and wetland habitats due to urbanization, the ability of the site’s wildlife populations to regenerate after flood disturbance by long-distance dispersal of immigrants from offsite would be likely to decline, particularly for infrequent or rare species, and species with limited dispersal ability. Thus, decreasing habitats and fragmentation of the areas surrounding Dutch Slough would likely cause a decline in the stability of existing habitats, even with “no action”. As sea level rises in the 21st century, the risk of catastrophic levee failure is likely to increase.

Gradual, long-term, non-catastrophic changes in the Dutch Slough Restoration Project site’s wetland habitats are likely to occur even with no project, because of the existing soil conditions and their responses to drainage and flood irrigation. Most of the soils on the site (other than relict ancient dune sands) are high in organic matter deposited in historic tidal marshes. When organic soils

are drained and aerated, they decompose and subside (lose volume) under the influence of aerobic soil bacteria and fungi. As the shallow basins in the diked pastures subside farther below sea level, they become more difficult to drain. When seasonal wetland vegetation is flooded (by rainfall or subirrigation) and soils are saturated (lacking oxygen) soil bacteria generate sulfides, and soluble salts dissolve in ponded waters. When soils drain, soluble salts concentrate by evaporation in poorly drained flats (seasonal ponds, alkali meadows), and sulfides are converted to sulfates (acidic and somewhat toxic to some plants, depending on concentration). Thus, the Dutch Slough Restoration Project site in the “no project” alternative would likely fall farther below sea level as sea level rises, soils subside, and soil quality declines. This is a general regional trend of agricultural lands reclaimed by diking tidal marshes in the 19th and early 20th century.

Over time, increased, ongoing subsidence in the “No Project” alternative would tend to increase the extent and depth of seasonal ponds, and their duration of flooding. Freshwater marsh and ponds would probably encroach on alkali meadow and other shallow seasonal wetlands. Within freshwater marsh, larger areas may convert to seasonal or perennial pond habitat, with more annual marsh plant cover and less tule or cattail marsh. Following levee overtopping events (with increasing frequency expected as sea level rises and storm frequency and intensity increases), depth and duration of ponding may expand nontidal pond habitats, and possibly expand the area of deep water suitable for diving birds and predatory nonnative fish. Increases in predatory fish within perennial ponds could reduce viability of native amphibian and reptile populations within nontidal freshwater marshes bordering ponds.

This impact is not considered significant because it is the result of changing background conditions and not related to any change in existing activities on the site.

Table 3.4-2: Summary of Terrestrial Biological Resource Impacts for Dutch Slough and Related Projects.

| | Impact No. | Impact Description | Dutch Slough Restoration Project | Related Projects | |
|--------------------------|------------|--|----------------------------------|-------------------|-----------------------------|
| | | | | Ironhouse Project | City Community Park Project |
| Alternatives 1, 2, and 3 | 3.4.1-1.1 | Potential Impacts to Wildlife in Irrigated Pasture and Ruderal-Terrestrial Habitats. | X | X | X |
| | 3.4.1-1.2 | Wildlife Disturbance (Direct and Indirect) Associated with Recreation on Terrestrial Habitats. | X | | X |
| | 3.4.1-1.3 | Wildlife Disturbance from Lighting and Noise. | | | X |
| | 3.4.1-2.1 | Potential Impacts to Wildlife in Tidal Freshwater Marsh Habitats from Dredging Little Dutch Slough. | X | | |
| | 3.4.1-2.2 | Wildlife Disturbance (Direct and Indirect) Associated with Recreation around the marsh edge. | X | | X |
| | 3.4.1-2.3 | Wildlife Disturbance (Direct and Indirect) Associated with Maintenance of Exterior Levee. | X | | |
| | 3.4.1-3. | Potential Impacts to Nontidal Freshwater Marsh and Riparian Woodland/Scrub and associated wildlife species—Loss of Habitat | X | X | |
| | 3.4.1-4. | Potential Impacts to Alkali Meadow And Seasonal Wetland Flats and associated wildlife species—Loss of Habitat. | X | X | |
| | 3.4.1-5.1 | Potential Impacts to Special-status Plants. | X | X | X |
| | 3.4.1-5.2 | Impacts to Special Status tidal marsh plants of dredging Little Dutch Slough. | X | | |
| | 3.4.1-5.3 | Impacts of Loss of Terrestrial and Wetland Habitats to Special-Status Plants. | X | X | X |

| | | | | |
|-----------------|--|--------|---|--------|
| 3.4.1-6. | Potential Impacts to Special-status Bat Species—loss of roosting sites | X | | X |
| 3.4.1-7. | 3.4.1-7. Potential Impacts to Cooper's Hawk—loss of nesting trees | X | | X |
| 3.4.1-8.1 a, b. | 3.4.1-8. Potential Impacts to Swainson's Hawk 3.4.1-8a. Loss of foraging habitat 3.4.1-8b. Loss of nesting trees | X X | X | X X |
| 3.4.1-9. | Potential Impacts to Burrowing Owls—loss of habitat | X | X | X |
| 3.4.1-10. | Potential Impacts to White-tail Kite and Northern Harrier—loss of foraging and nesting trees | X | X | X |
| 3.4.1-11. | Potential Impacts to Nesting Birds—loss nesting habitat | X | | X |
| 3.4.1-12. | Potential Impacts to Tricolor Blackbirds—loss of foraging habitat | X | X | X |
| 3.4.1-13. | Potential Impacts to California Horned Larks—loss of habitat | X | X | X |
| 3.4.1-14. | Potential Impacts to Loggerhead Shrikes—loss of foraging habitat | X | X | X |
| 3.4.1-15. | Potential Impacts to Yellow-breasted Chat and other Songbirds of Marsh and Riparian Habitats | X | | |
| 3.4.1-16. | Potential Impacts to Special-status Wading Birds | X | | |
| 3.4.1-17. | Potential Impacts to California Black Rail | X | X | |
| 3.4.1-18. | Potential Impacts to California Tiger Salamander | X | X | X |
| 3.4.1-19. | Potential Impacts to California Red-legged Frogs | X | | |
| 3.4.1-20. | Potential Impacts to Northwest Pond Turtles | X | X | X |
| 3.4.1-21. | Potential Impacts to Giant Garter Snakes | X | X | X |
| 3.4.1-22. | Potential Impacts to Silvery Legless Lizard | X | | |

| | | | | | |
|--|-----------|--|---|---|---|
| | 3.4.1-23. | Potential Impacts to Vernal Pool Fairy Shrimp and Other Special-status Vernal Pool Invertebrates | X | | |
| | 3.4.1-24 | Potential Impacts to Valley Elderberry Longhorn Beetle | X | | X |
| | 3.4.1-25 | Potential Impacts to Heritage or other trees protected by local ordinance. | X | | X |
| | | Cumulative Impacts to Terrestrial and Wetland Biological Resources | X | X | X |

Table 3.4-3: Summary of Terrestrial Biological Resource Mitigation Measures for Dutch Slough and Related Projects.

| Mitigation No. | Mitigation Measure | Dutch Slough Restoration Project | Related Projects | |
|----------------|--|----------------------------------|-------------------|-----------------------------|
| | | | Ironhouse Project | City Community Park Project |
| 3.4.1-1.1 | Avoid and minimize effects of loss of irrigated pasture and ruderal habitats through project timing and phasing. | X | X | X |
| 3.4.1-1.2 | Habitat enhancement to offset effects of habitat loss and disturbance on terrestrial habitats associated with recreation. | X | | X |
| 3.4.1-1.3 | Reduce effects of City Park lighting and noise. | | | X |
| 3.4.1-2.1a-b | 1a: Increase acreage of tidal freshwater marsh. | X | X | |
| | 1b: Avoid channel widening and dredge non-native SAV beds. | X | | |
| 3.4.1-2.2 | Habitat enhancement to offset habitat loss and disturbance around the marsh edge associated with recreation | X | X | X |
| 3.4.1-2.3 | Minimize disturbance (direct and indirect) associated with maintenance of exterior levee | X | | X |
| 3.4.1-3 | Design restoration plans to minimize impacts to nontidal freshwater marsh and riparian woodland/scrub and associated wildlife species. | X | X | |

| | | | | |
|-----------|--|---|---|---|
| 3.4.1-4 | Recreate habitat features to reduce potential impacts to wildlife of alkali meadow and seasonal wetland flats. | X | X | |
| 3.4.1-5.1 | Minimize, avoid, and compensate for impacts common to all sensitive plants. | X | X | X |
| 3.4.1-5.2 | Minimize, avoid, and compensate for impacts to sensitive species of tidal marsh plants | X | X | |
| 3.4.1-6 | Minimization and compensation for Potential Impacts to Special-status Bat Species | X | | X |
| 3.4.1-7 | Minimization, avoidance, and tree replacement for impacts to Cooper's Hawk | X | | X |
| 3.4.1-8.1 | Off-site mitigation for loss of Swainson's Hawk foraging habitat. | X | X | X |
| 3.4.1-8.2 | Avoid and minimize loss of Swainson's Hawk nesting trees. | X | | X |
| 3.4.1-9 | Minimize and compensate for potential impacts to Burrowing Owls. | X | X | X |
| 3.4.1-10 | Off-site mitigation for loss of White-Tail Kite and Northern Harrier habitat. | X | X | X |
| 3.4.1-11 | Mitigation for potential impacts to nesting birds. | X | | X |
| 3.4.1-12 | Mitigation for potential impacts to Tricolor Blackbirds. | X | X | X |
| 3.4.1-13 | Off-site mitigation for potential impacts to California Horned Larks. | X | X | X |
| 3.4.1-14 | Off-site mitigation for potential impacts to Loggerhead Shrikes. | X | X | X |
| 3.4.1-15 | Mitigation for potential impacts to Yellow-Breasted Chats and other Marsh and Riparian Songbirds. | X | | |

| | | | | | |
|--|----------|--|---|---|---|
| | 3.4.1-16 | Mitigation for Special-Status Wading Birds. | X | | |
| | 3.4.1-17 | Mitigation for potential impacts to California Black Rail. | X | X | |
| | 3.4.1-18 | Mitigation for potential impacts to California Tiger Salamander. | X | X | X |
| | 3.4.1-19 | Mitigation for potential impacts to California Red-legged Frogs. | X | | |
| | 3.4.1-20 | Mitigation for potential impacts to Northwestern Pond Turtles. | X | X | X |
| | 3.4.1-21 | Mitigation for potential impacts to Giant Garter Snakes. | X | X | X |
| | 3.4.1-22 | Mitigation for potential impacts to Silvery Legless Lizard. | X | | |
| | 3.4.1-23 | Mitigation for potential impacts to Vernal Pool Fairy Shrimp and other Special-status vernal pool invertebrates. | X | | |
| | 3.4.1-24 | Mitigation for potential impacts to Valley Elderberry Longhorn Beetle. | X | | |
| | 3.4.1-25 | Mitigation for potential impacts to protected trees. | X | | X |